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SEASON'S GREETINGS

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION wishes all of its many friends a most hearty Merry Christmas and a Happy and Prosperous New Year.

TRANSPARENTIZING A DRAWING

Drawings made on opaque paper which are to be blueprinted may be transparentized by using one of the following solutions:

Formula No. 1

1 part Canada balsam
9 parts benzol
Mix and rub on back of sheet.

Formula No. 2

4 oz. banana oil
10-cent tube white vaseline
Mix by heating slightly. Oil side of paper turned toward light. Keep in stoppered bottle.

PLEASE REMEMBER

Drop us a card if you wish to obtain a title page and index for Volume 28 of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

These indexes will be available shortly.

This Month's Cover

Pouring a large aluminum-alloy sandcasting. Photograph, courtesy of Aluminum Company of America, Pittsburgh, Pa.

Articles Indexed — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."
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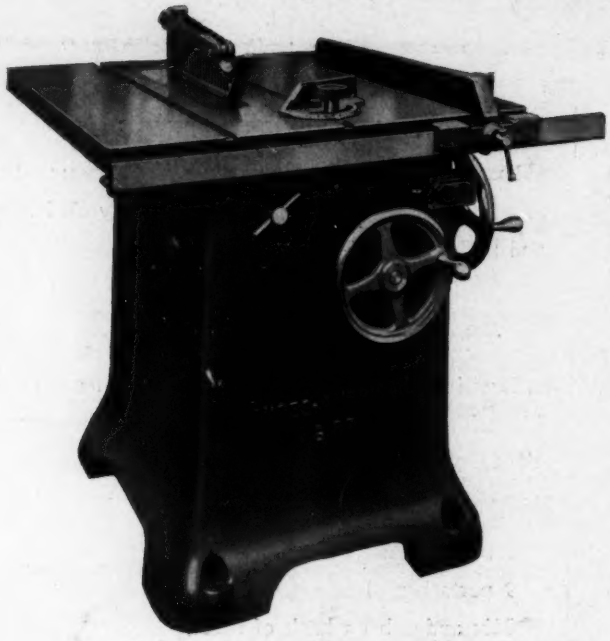
The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Phillippine Education Co., Manila, P. I.

G-87 VARIETY SAW



The design of every Yates-American school machine is influenced by three important factors: safety, capacity and strength.

Because of the youth and inexperience of student operators, our engineers have provided every possible safety feature on these machines. Moreover, these features are built-in . . . incorporated as an integral part of the machine. All moving parts are enclosed and fully guarded.

School machines to be practical must be adequate in capacity. That's why Yates-American equipment is all full size . . . built like the machines of industry. We definitely do not offer toy type machines on a price basis.

Lastly, these machines must be strong. They are built with a wide margin of strength . . . extra heavy . . . they stand up under the abuse of youthful inexperience and carelessness.

Full information about the G-87 Saw described above or any of the other school machines of our manufacture will be sent promptly on your request. Write now.

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This is the thirteenth of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

There's no need to coddle the G-87 Circular Saw . . . it asks no favors, no special consideration. In fact, it's so sturdy and powerful that large numbers of these tilting arbor saws are bought each year for industrial use . . . convincing proof it *has* stamina and strength.

It is built on a one-piece cast-iron frame which insures greater rigidity, and consequently, greater accuracy. The heavy table is carefully machined to provide a smooth working surface.

The steel saw arbor is extra heavy and is mounted in deep groove, selected, precision, ball bearings of generous size. The swinging frame which carries the saw arbor and motor units is mounted on accurately machined trunnions which help retain a perfect alignment at all times.

The operating screws on both the tilting mechanism and the vertical adjustment of the saw are supported on roller thrust bearings. Adjustments are made easily and conveniently.

This saw is regularly furnished with a fully enclosed two horsepower fan cooled, dust-proof motor which is mounted directly on the saw arbor.

SHORT TALKS ON WOOD

MAHOGANY

(Swietenia mahogani)
(Swietenia macrophylla)
(Khaya ivorensis)

Mahogany has acquired the reputation of possessing all the characteristics of an ideal cabinet wood. It is tough, strong and highly stable in fashioned form. Easy to work, polishes very well. Has a rich, golden brown color which deepens with age. Beautifully figured. The grain is very likely to be variable, causing a pleasing, changeable reflection of light.

Is used extensively in the manufacture of furniture, boats, cabinets, and interior trim, and in pattern making. Mahogany veneers are available in a wide range of figures and patterns.

An imported wood that grows in tropical American and African forests. Principal sources now are southern Mexico and Central America, the upper Amazon region and the west coast of Africa. Trees grow scatteringly throughout the jungle and are logged with considerable difficulty.

Mahogany trees average approximately 100 feet in height and the diameters range from 2 to 4 feet.

The bark is ridged and not unlike the bark of the elm tree. The leaf is compound, usually with four pairs or leaflets, and similar in appearance to the leaf of the ash tree. The fruit is a hard, woody, pear-shaped capsule from 2 inches to 6 inches in length which stands erect on the branch of the tree. The hard covering splits in five sections when ripe, exposing a core with five double rows of winged seeds.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Philosophy of Industrial Arts for American Education

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A discussion of the place and importance of industrial arts in general education and as a preparation for vocational education.

Both philosophy and principles are included in the title of these statements because of the rather indistinct line which separates these classifications of knowledge or belief *in education*. There is the practical difficulty involved of determining when a statement of a concept is one that falls definitely in one classification or the other. One finds few practical drawbacks in his thinking about various aspects of industrial arts and their development by thus grouping together such directional statements of policy and not raising the question as to just what degree of acceptance each has attained in the progressive development from *philosophy* to *principle*. Hence, in the following statements, the term *philosophy* may apply to that type of knowledge generally so designated, or to principle.

What is Philosophy?

Some definitions of philosophy are, "the *study and knowledge* of principles," etc., "practical wisdom that comes from *knowledge* of general laws or principles." Here the inference is plain that philosophy is knowledge *about* principles. In popular current thought, philosophy also includes the concept that this knowledge about a systematic body of general conceptions or principles has little implication so far as their *practical* applications are concerned. Philosophy is the necessary first step in the never-ending evolutionary development which lifts us to continually higher levels. There should be no conflict between philosophy and science in education. Philosophy precedes. Both avenues of progress are based on reflective thinking.

What is a Principle?

We try out procedures to see if they appear to achieve the ends that we set up. If there is reasonable evidence that they do, we accept them as a part of general practice awaiting the time when experimental or other evidence shows that they are sound and that they can be classified as principles.

Definitions of the restricted meaning of *principle* are, *that from which anything proceeds, a fundamental truth; maxim; axiom; postulate,* a settled rule of action, a governing law of conduct.

For a social science such as education, Doctor Theodore H. Eaton provides a broader definition of a principle; namely, "A conscious belief that exercises a directing influence upon our dealings with various particular situations."

Bases of Statements of Philosophy of Industrial Arts

In the statements of philosophy which follow, four conditions should be kept in mind.

A philosophy of industrial arts, like the philosophy of the junior high school, should be based upon the individuals served, their needs, interests, capacities (mental and physical), aptitudes, and abilities.

A philosophy of industrial arts reflects present and reasonably possible practices, conditions, and limitations such as are found in the general education of American public schools.

A philosophy of industrial arts embraces subject matter, personnel management, methods, psychology, equipment, supplies, and products.

A philosophy of industrial arts must be in harmony with the accepted philosophy and principles of all education of which it is an integral part, insofar as these approach the truth.

To be a part of the American system of education, industrial arts must stand upon the demonstrated immediate values of its particular contribution, and also upon the great and final values, some of which may be quite intangible and deferred.

What we believe all of our education must be is in turn dictated by our own belief in and support of our particular system of government and of the free institutions which are characteristic of American life under this system of government.

Education, Government, and Free Institutions

Our complete program of government, in addition to being democratic in concept and spirit, and republican in the mode of conduct, is being somewhat modified and greatly expanded by the growth and dominance of industry. This industrialization is reflected in great metropolitan massings of people, in dependence upon the machine, in rapid readjustments in industrial occupations and workers, in interdependence of individuals and groups, in rapidly growing cosmopolitan attitudes, and in greater influence upon our economic structure by industry. Few Americans can longer build their homes where they will not see the smoke of their neighbor's chimneys. As our democracy becomes more dominantly industrial the number of services and controls delegated to or assumed by government grows in all types of governmental units.

Guarded as jealously as are our fundamental concepts of government are our free institutions. These frequently must be guarded and defended in their fundamental concepts from encroachment under one guise or another. Chiefly do we think of free speech, free press, and now radio, the right of peaceful assembly, free universal education, freedom of religious thought, and the right of individual initiative (largely occupational) so long as it does not harm others. Citizenship demands that

education provide its fair share in the training in and appreciation of democratic principles behind the freedom of these institutions.

Philosophy of Education as a Whole

Educational philosophy attempts to lay a foundation broad enough to bring about the balanced development of such attitudes, knowledge, appreciations, and skills as are essential, not only in the preservation of our ideals and institutions, *but also in their progressive development*. Education in the United States is in general agreement upon some phases of educational philosophy. Many of these philosophic points of view would rate as accepted principles. Following are some of them:

Education of less than college grade should be under public support, supervision, and control.

Education should be decentralized in its control, with the local or consolidated school district and the state dividing most of the authority.

Education in a complex and rapidly changing democratic order such as ours must be dynamic and continuous, essentially from the cradle to the grave. Plato said, "Education begins with the first cry and ends with the last sigh."

Education, to be democratic, must provide differentials in content, methods, and control to provide the necessary stimuli for and the development of all normal citizens with their several personal differences.

Education in an industrial democracy must provide for the sustaining and the developing of society as a whole as well as of the individual. Social and educational pioneering in the years just ahead lies largely in this area. In the future we must strike a reasonable balance between rugged individualism and general social welfare.

Education must be guided by an ever advancing philosophy, and then supported, given direction by, and executed through the aid of scientific educational procedures.

All education should be for current living as well as a preparation for future activities of life.

Education must be democratic in its purpose and control as well as in its content in order that young people and adults be given experiences of living together democratically.

Education in the several school levels and in the several types of schools must provide varying degrees of vocational finding and vocational education of both the preparatory and the extension forms.

Definitions of Industrial Arts

Industrial arts is a varying but representative group of handcraft and industrial-machine experiences offered so as to develop the needed general industrial knowledge of all boys (and in modified form for girls) in the complex and changing occupational-economic-social-political order of America.

A quarter of a century ago Doctor Frederick G. Bonser, in enunciating the social-industrial theory of industrial arts, wrote, "Industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the *problems of life* related to these changes."

These definitions of industrial arts reflect educational contributions of a nature particularly keyed to the early adolescent years, twelve to fifteen, or grades 7, 8, and 9. Industrial arts fits well into the junior high school. Due to physical circumstances its contributions must at times be delayed, unfortunately, until later years. However, the general handwork of the elementary school and the specialized vocational, technical, and creative activities of the senior-high-school years are essentially different aspects of the broad area of *industrial education*.

Philosophy and Principles of Industrial Arts

LEARNING AND DEVELOPMENTAL EXPERIENCES IN INDUSTRIAL ARTS, THROUGH TYPES OF EXPERIENCES NOT OTHERWISE AVAILABLE, ARE ESSENTIAL IN THE COMPLETE SOCIAL EDUCATION OF EVERY BOY IN A DOMINANTLY INDUSTRIAL DEMOCRACY. Such a statement is well near the top of any list of statements of philosophy today.

1. Industrial arts is a great social leveler. Here boys of "both sides of the tracks" meet in an interesting and instructive environment. They must give and take and work cooperatively at times. All members get some insight into how more than one half of American wage earners work.

2. Explorations (firsthand study of occupations through tryout experiences) provide one way of laying the foundation of all vocational and educational guidance. Self-analysis, counseling, placement, and follow-up are built upon the study of occupations. Emphasis upon this aim of industrial arts varies somewhat in different sections according to the dominance of industry. Helping to prevent occupational misfits is economically sound and socially desirable. Industrial arts assists in this through its directing influence on a boy *either toward or away from* industrial occupations as a group. Sometimes it helps him to find a particular trade or industry in which his capacities, aptitudes, and possible abilities lie. Its educational guidance value has been demonstrated where exploration has been stressed.

3. Industrial arts adds to the delights of home, garden, mechanical devices, and civic improvements when consumers' values are stressed. Intelligent and discriminating demand for, and selection and consumption of the products of industry are stressed. Consumer's appreciations involve problems of workers, workmanship, structural and aesthetic design, materials and appropriateness. We must all select and consume the products of industry though we are not all producers in industry. Such consumer emphasis has a very logical place in industrial arts. It results in personal cultural satisfactions and creates a demand for better manufactured goods and possibly more of them. It is a splendid way of developing general industrial intelligence in youth — in this instance in either boys or girls. Consumer appreciation of industrial things can be taught to many in industrial arts, whereas the number in whom actual skill in design and manual execution can be taught is more limited.

4. Studies of social, economic, and related occupational problems of industry have found a place in the courses of study of progressive teachers who interpret industrial arts as being more than just manual skills, technical knowledge, and guidance. Such teachers are attempting to interpret industrial life broadly. Included in these socio-economic phases of industry are problems involving personnel management, state and federal regulations, education and training, problems of financial management and ownership, production costs, raw products, distribution and organization of workers. These are problems of education, based upon industrial life. Where is there a better place to study them than in industrial arts? The learners are still young. In public-school classes pupils represent a cross section of the community, employed workers, management, owners, and others. In private secondary *schools* the need of emphasizing these social-economic aspects may be more important than in public schools, because frequently the pupils who attend these schools inherit positions of industrial ownership or management. Pupils should study problems at least in part *through applications* rather than almost wholly through principles or theoretical conditions. The industrial teacher, quite frequently, has had wage-earning experience at a trade or in industrial work to guide him in his interpretations. He sees the problems of management also. He is in a key position — a *public* school *industrial* teacher.

THE INDUSTRIAL ARTS CONSTITUTE A GROUP OF SCHOOL EXPERIENCES WHICH EMBRACE THE MOST FUNDAMENTAL PROCEDURE IN EDUCATION; NAMELY, LEARNING THROUGH A COMBINATION OF SEEING, HEARING, THINKING, AND DOING. Subject matter consists of the thoughts and life experiences of men. American colonial education consisted of training in manual skills supplemented by the three R's and religion. The growth of cities, the scientific movement, and the educational philosophy of formal discipline took away the practical phases of our youth education. Practical-arts activities and vocational education have brought back to the secondary schools just about all of the real-life learning experiences that we now have. As a result, some progressive school administrators have made either industrial arts or the practical arts a veritable core of the junior-high-school curriculum.

Too much of our schoolwork today centers around the life experiences of others. Children have such education

served to them on a "blue platter," as it were, mostly ready prepared, the *recorded* experiences of others. Such experiences are pseudo. Such education is unreal. A few can profit by it. For the many, an education of recorded secondhand thoughts only, is socially dangerous. Herein lies a particular educational significance of industrial arts and the other so-called practical subjects. Providing real-life situations, or something closely approaching them, as agencies of learning, is one of the chief reasons that students have a keen interest in vital industrial-arts education, and even in such industrial-arts work as is considered formal and stereotyped.

INDUSTRIAL ARTS IS A CONVENIENT AND NATURAL AGENCY FOR EDUCATIONAL CORRELATION. Correlation is the first step in integration and frequently the only one possible under usual public school conditions. It would be difficult to find a group of subjects or pupil experiences wherein there are so many opportunities to show interrelationships as the *seeking teacher* finds in industrial arts, either in a general-shop course or in a series of unit courses. There are many opportunities for correlation within a single course, correlations of manual with manual, informational with informational, and informational with manual. Then one may go beyond the department to others. Excellent correlations and cooperation have been worked out at times between industrial arts and English, the physical sciences, art and design, journalism, agriculture, home economics, foreign languages, and school-wide programs of vocational and educational guidance.

In addition to the above correlating possibilities it should be pointed out that industrial arts occasionally provides natural conditions conducive to mutual cooperation. This occurs not only between individuals but also in group projects.

The interest factor plays a prominent part in the kind and amount of learning accomplished in industrial arts. It is the entering wedge and the driving force which makes students strive. Where effort is expended, changes (education) occur in the individual. This interest in equipment, procedures, materials, workers, and products is the vehicle on which the alert teacher carries his pupils to desirable correlations with other areas of knowledge, and teachers and students in other subjects with that which goes on in industrial arts.

THE VEHICLE OF LEARNING, THE PROBLEM, JOB, OR EDUCATIONAL PROJECT, IS THE PHYSICAL EXPRESSION OF A PUPIL'S EDUCATIVE EXPERIENCES AND GROWTH. These two factors are frequently confused one with the other. Pupils, parents, other teachers, and school officials, the press, the community at large, and very frequently industrial-arts teachers themselves must be brought to a realization of this truth. The activities behind these experiences may be altering, assembling, modeling, operating, and depicting. *Neither design, nor speed, nor quality of construction, nor all of these factors combined tell the true story of what a boy has learned through an educative work experience.*

In the junior-high-school grades, boys have greater interest in jobs, projects, and problems, than they do in trade operations or processes. This fact makes the article or job more significant than a series of trade operations as a basis for course making. Under these circumstances, it is conceivable that some students will not experience or learn all of the trade processes that other members of a class do. However, the manual skills that are taught and practiced must follow the most approved trade practices. There must be no occasion for the difficult task of unlearning later.

INDUSTRIAL ARTS PROVIDES A READY AVENUE OF SELF-EXPRESSION FOR LARGE NUMBERS OF PERSONS WHO FIND MANY OTHER AVENUES FOR SUCH EXPERIENCES CLOSED. It appeals to youths and adults. It appeals to boys and men, and in some of its aspects to girls and women. It may be conducted individually or in groups, in the home shop or a school or group shop. For brain workers, it can be an "escape." For many manual workers, it can provide personal satisfactions which are rapidly slipping away in quantity-producing industries. For boys in school it frequently is the one place where they may experience the pleasure of creativeness, for in its practice the degrees of emphasis upon the art phase and the craft phase vary greatly with what is undertaken and the way it is undertaken.

INDUSTRIAL ARTS IS FUNDAMENTALLY AND NATURALLY CHILD CENTERED IN ITS CONCEPTS AND IN ITS PRACTICE OF METHODS, SUBJECT MATTER, AND CONTROL. Since very early in its history in the United States, the industrial aspects of education have been based in part upon individualized instruction. This is verified by recalling that *industrial and agricultural education contributed the educational project to American education.* The craftsman method of production is generally employed rather than the quantity-production procedure, except as the latter is used to give an insight into what industrial quantity production is like, for purposes of guidance. The craftsman procedure is based upon the individual and his doing of the complete job. In the informative aspects of industrial arts also, the progressive industrial-arts teacher finds opportunities for the individual student to follow his interest in investigations, readings, observations, and reports. The alert teacher of industrial arts finds opportunities for securing for his students many of the individualizing values of such "plans" as the Dalton, Winnetka, Morrison, and contract. Industrial arts, after all, remains a combination of art and craft and humanity rather than an exact science or a study of static subject matter.

SOME PHASES OF INDUSTRIAL ARTS ARE APPLICABLE TO GIRLS AS WELL AS BOYS. Girls and women, in the operation of the household, the car, communication devices, and the garden are confronted with the use, adjustment, and occasional repair of mechanized laborsaving devices. Their complete education in the practical arts is no longer confined to the cooking, sewing, cleaning, and gardening. It is just as important for them to have a working knowledge of adjustments and simple repairs on electrical, mechanical, plumbing, and structural devices, materials, arrangements, and assembly as it is for boys to learn fundamental things about home sanitation, health, budget, selection of clothing, diet, preparation of food, furniture, and interior decoration. In some instances, as in a course in household mechanics for girls, the content may be somewhat limited as compared with similar courses for boys. Segregation of boys and girls is usually better in such instances. At other times, as in a course in home planning, interior decoration or landscape gardening (agriculture) and various types of craftwork, the class may well be mixed.

IN INDUSTRIAL ARTS, AS IN OTHER SCHOOL ACTIVITIES, WHAT LITTLE CARRY-OVER VALUE OR TRANSFER OF TRAINING OCCURS TAKES PLACE MORE AS A RESULT OF THE METHODS OF TEACHING EMPLOYED THAN THROUGH THE PARTICULAR SIGNIFICANCE OF SUBJECT MATTER. This is rather conclusively proved in two studies.[1] This fact is important today chiefly because *manual training* found a place in American education in the 1880's and the 1890's through its claims of important disciplinary and transfer values and significant subject matter. The important thing in connection with transfer is to recall that the way a teacher teaches industrial arts is more important than what he teaches. He must also consciously direct pupils' attention to the procedures that they use in solving a problem.

Industrial Arts and Vocational Education

INDUSTRIAL ARTS AND VOCATIONAL INDUSTRIAL EDUCATION ARE COMPLEMENTARY PARTS OF A COMPLETE INDUSTRIAL EDUCATION — AN EDUCATION BASED UPON IMPORTANT FACTORS OF CURRENT INDUSTRIAL LIFE AND DEVELOPMENT. The social, educational, and cultural significance of industrial arts to all normal boys and in modified form to all girls has been discussed. For the more than half of the prospective wage earners of the nation who will enter trade and industrial occupations, it forms, in addition to these aspects, an introduction to vocational-industrial training or to actual trade entrance. For these latter persons it assists in determining whether or not they should enter the trade

[1] Whipple, Guy M., "The Transfer of Training." *Twenty-seventh Yearbook, National Society for the Study of Education*, Part II.
Mathematical Association of America, Inc., *The Reorganization of Mathematics in Secondary Education*, Chapter IX, especially pp. 93–99, 1923.

and industrial occupations, and it may help in the selection of a specific one. Without this aid in the selection and introduction to the work, the specialized training in trade and industrial education which follows cannot function as successfully as it otherwise would. Where industrial arts has been omitted, trade schools must resort to a substitute for it, the reservoir or orientation class. For prospective wage earners who will enter the trade and industrial occupations the omission of either industrial arts or vocational-industrial education forms a serious gap in the complete *industrial education* of youth. A limitation in either phase of industrial education cannot but affect the other phase adversely, as well as the youth it purports to serve.

THE OBJECTIVES OF A PARTICULAR INDUSTRIAL-ARTS COURSE OR ACTIVITY MUST BE IN HARMONY WITH THOSE OF THE INDUSTRIAL-ARTS DEPARTMENT OF WHICH IT IS A PART; THE AIMS OF THE DEPARTMENT IN TURN WITH THE AIMS OF THE JUNIOR HIGH SCHOOL, SENIOR HIGH SCHOOL OR SECONDARY EDUCATION AS A WHOLE; AND FINALLY THE AIMS OF SECONDARY SCHOOLS MUST CULMINATE IN RECOGNIZED CONTRIBUTIONS TO ALL ORGANIZED OR FORMAL EDUCATION. The objectives of secondary education have been carefully formulated and these are generally accepted. The objectives of the junior high school have been well defined, There are acceptable statements of the objectives of all education. The objectives of particular senior high schools vary with specialization and other factors involved. It seems almost a truism to state it, but industrial-arts departments and subjects must make their particular contributions to the *accepted* objectives of secondary education and particularly to the general or cultural aspects of it. Too often we in industrial arts have set up objectives for our phase of education entirely oblivious to what is expected in outcomes of all education.

THE TEACHER'S PLAN OF ORGANIZATION AND HIS CONTROL OF PERSONNEL, EQUIPMENT, SUPPLIES, PRODUCTS, AND SAFETY, CONTRIBUTE MANY OF THE DESIRABLE EDUCATIONAL OUTCOMES OF THE INDUSTRIAL ARTS. These aspects are as important educationally as methods and subject matter. The student learns much of what industrial life is like through observation of and participation in the successful operations of a small, semiproductive enterprise, the school shop. Routine controls must be established. Students participate in these. But these desirable educational outcomes result only when the teacher plans these managerial aspects, and directs student activity and participation in them with this outcome definitely in mind. These phases of industrial arts are very important parts of the written courses of study.

INDUSTRIAL ARTS ABOUNDS IN NATURAL SITUATIONS CONDUCIVE OF CREATIVE THINKING OR PROBLEM SOLVING. The outstanding change that has been made in the objectives of American secondary education since their formulation by a committee of the National Education Association in 1918 has been the inclusion of an aim based upon procedure and methods of teaching rather than upon subject matter. In an age of technological science we have finally come to realize that we do not train in or give much practice in the procedure of reasoning or the scientific method or problem solving. A background of knowledge and mental and manual skills are insufficient today, and we now demand that persons be given opportunities to utilize these backgrounds in attempts to solve new problems. Not all students respond to this type of education. Those who will be the leaders in all kinds of life activities in the future do so greatly. An attitude of inquiry, initiative, self-direction, and a willingness to measure results are some of the attributes of those who respond well to this emphasis in industrial arts.

Industrial arts has particular contributions to make in this matter of developing native capacity for problem solving. One is through the educational project, either the individual or the group in which (1) a need is recognized, (2) a plan to fill the need is made, (3) the job or work is executed, and (4) the results are evaluated. Another contribution lies chiefly in the fact that the problem solving is accomplished through means of concrete materials, and the result of the problem solving finally stands before one in physical form, a thing than can be judged and tested in an objective way. These significant characteristics which lead a learner to carry problem solving through to a result which stands in concrete form are a particular contribution of industrial arts and other practical subjects.

INDUSTRIAL ARTS PROVIDES A READY AND NATURAL AGENCY FOR A DEGREE OF FOUNDATIONAL TRAINING IN INDUSTRIAL VERSATILITY. Some industrial versatility is coming to be recognized as an important factor in helping many youths to secure their first job in trade and industrial occupations. This type of training is almost impossible at present in vocational-industrial education conducted within the provisions of the federal-aid law which provides almost solely for specialized industrial education. A few communities sensing the need for some vocational education stressing versatility, within a general occupational area, have established schools and classes outside of the control of the federal law. Industrial courses in cosmopolitan and technical high schools provide similar opportunities at times. Such courses lie somewhat between the industrial arts of the junior high school and specialized vocational-industrial education of the senior-high-school level. While disavowing any intention of teaching trade skills for wage-earning purposes in the junior high school, the industrial-arts teacher there cannot but contribute some degree of training in versatility within a general field. Later it may be vocational in outcome. Then it will aid in occupational placement as well as in occupational selection.

IN THE TEACHING OF INDUSTRIAL ARTS, THE TEACHER IS MORE IMPORTANT THAN SPACE, EQUIPMENT, AND SUPPLIES. The industrial-arts teacher who is an educator and who sees the several educational, social, developmental, and cultural outcomes reflected in this discussion of philosophy can accomplish much more, even with limited facilities, than the run-of-the-mine teacher with all of the physical facilities he desires. Personal spirit, educational vision, and initiative can overcome shortcomings in facilities when the real objectives are constantly kept in mind.

The main principles of the new education appear to be: First, that the student receive freedom of legs, arms, and voice . . . the first step toward freeing his mind and spirit. Second, the proponents of the new education assume that growth comes from the child progressively acquiring new experiences in connecting them in new patterns. There is no attempt to make the student learn subject matter not related in his thinking to problems and activities of life. Third, student initiative is implied. Initiative comes from teaching the student to make decisions for himself. Fourth, they assume that self-expression on every possible occasion should be emphasized. A varied program should be provided to permit the uncovering of latent talent of students. Fifth, the leaders of the new education imply the need in so far as practicable for students understanding real life. Sixth, they assume that activity in addition to race experience is an important factor.

The new education is defined in terms of meaningful activities and rich experiences based upon adult insight and children's interests and needs which result in reflective thinking. The final admonition is "be not the first by whom the new is tried nor yet the last to lay the old aside."[2]

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Industrial Arts Cooperates

Frederick James Moffitt

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Time: About ten years ago.
Place: Office of the high-school principal.
Characters: The principal and little Johnnie.

PRINCIPAL (*Musing, as he looks severely at Johnnie*): What on earth shall I do with the boy now. He has an I.Q. that is certainly on the lower levels. He has shown no interest in his Latin lessons and he is failing in history. He has been impudent to his teachers and is a general disciplinary problem around the school. I guess I'll have to fire him. (*A light dawns.*) No, I'll send him to that new department that we just established, the industrial-arts department. He can't do much harm down there and it may keep him quiet until he gets old enough to leave school. Miss Smith: take a memorandum! Johnnie is hereby transferred to the industrial-arts department where the instructor is urged to keep him out of mischief.

Curtain

The interesting sequel to this little soliloquy, which has been acted out in hundreds of schools, is that Johnnie was marched down to the industrial-arts department, and, surprisingly, did a pretty good job there. And, too, in spite of the wails and groans of the teacher of industrial arts, the department did a pretty good job on Johnnie — so much of a job that Johnnie failed to take advantage of the chance to leave school as soon as he could legally do so and actually became a pretty good school citizen.

Time was, and not so long ago, when the industrial-arts department in many a school was thus set aside for the boy who could not fit into the school anywhere else. It was a disciplinary center where youngsters were condemned to work out time because they were too slow for the regular curriculum. And though it may have been the disciplinary center, it was in no other respect the center of school life. Physically, it was crowded into the furthermost corner of the school so that the busy hum of work would not disturb the more scholarly meditations that were supposed to be taking place in the other departments. It was a long ways from the regular curriculum mentally, too. Industrial arts was tolerated by the "fundamentalists" as one more fad in the school curriculum.

Industrial Arts an Integral Part of General Education

But that time has gone. More and more, industrial arts is taking its place as an integral part of the school curriculum even though some of the moldier subjects in the curriculum have had to be relegated to the school attic to make room for a spectacular growth. Industrial arts has been given increasing physical space, more curricular consideration and a more significant part in the entire educational program. Educators, everywhere, are realizing that industrial arts has become an essential part of the education for youth today.

Why has this change come about within the past few years? There are many reasons, chief among them being that educators have been forced to change the course of the school in order to meet a changed condition of life inside the institution as well as outside. Social and technological changes have compelled a complete reorientation of the school as it affects the whole pattern of democracy.

It has been the boast of conservative educators that the school is not radical, that it does not accept change readily and thus acts as a stabilizing force on national thought. Such educators talk of the "cultural lag" that is inherent in the school. They defend the older type education with the argument that it is a good thing that the school may act as a repository of the cultural heritage of the past. They believe that the school as an instrument of democracy should move forward no faster than the most conservative thought of that democracy. The school must be slow to accept innovations, the school should not experiment.

Industrial arts has little of this "cultural lag." It stands firmly on the ground that school is both life and preparation for life. It demands that the school face practical issues. True enough, industrial arts has certain "lags" of its own but they are due to the lack of vision on the part of the leaders and instructors in the movement. It might be argued, somewhat unkindly, that while education suffers from a cultural lag, industrial arts suffers from a "mechanical" lag. An inspection of many school shops might reveal that there are a number of machines in the industrial-arts department that are antedated and that would not be tolerated for a moment in private industry; machines that have outlived their usefulness as tools of learning, equipment that is obsolete.

Wherever there is such a mechanical lag, it is due to the timidity of the industrial-arts instructor in demanding efficient tools with which to work, or the frugality of a board of education that has never been made to realize the importance of the subject in the school of today, or the indifference of a busy school administrator.

But this is an aside from the argument that industrial arts is a fast growing part of the new school curriculum. If growing pains are still apparent and if boards of education still do not realize that the younger member of the curriculum is growing up, that fact is being called to their attention forcefully wherever educational subjects and procedures are discussed.

Because of the growing pains, however, there are a number of mistakes and misunderstandings that arise between the industrial-arts department and the rest of the school. Industrial arts has been too content to accept its place as a minor part of the curriculum. It has been inarticulate and

Boys, girls, and adults must be accommodated by the industrial arts department of the centralized school

unassertive in the presence of the administration of the school. It has kept too much to itself and has made little attempt to take its place in the educational family. Not that the average industrial-arts instructor is entirely to blame, but busy with his own department, he forgets that many a school administrator is not thoroughly conversant with the possibilities inherent in the present industrial-arts program or he doesn't realize that some board-of-education members still think in terms of yesterday's school curriculum which was based on yesterday's college-entrance requirements.

Present-Day Requirements

Education is changing. There is a ferment in educational procedures. There is unrest among those who are responsible for the youth of today. There is a questioning by those outside the school who say: We are not blaming the school for the present plight of youth. If the school is to blame, it is our fault, too. But something must be done. Democracy is on trial and the school, as an instrument of democracy, is on trial. If the curriculum of an older day is at fault, then change the curriculum.

American education is waking up to the fact that the education for a static world

is not suitable for the young people of today. When the son could follow the profession of his father, when the skill taught in one generation could be useful for the next generation, when plans for youth could be made with the reasonable assurance that they were sound and practical, the school curriculum could meander and nap and waste time. But last year's atlas is out of date, last year's dictionary is old fashioned, last year's encyclopedia misinforms. We may wish it were otherwise and that there were less confusion and tumult in the world. But whether we like it or not, we are moving swiftly and in a dynamic world the stationary curriculum has lost its usefulness.

Education has come in for a great deal of criticism. At the expenditure of a tremendous sum of money, one great state in the union has just finished a survey of its schools and has not found them entirely satisfactory. Panaceas, sociological and political, are being presented and the resulting confusion is not conducive to peace of mind on the part of the educator. Increasingly the criticism boils down to this: Something must be done.

There is no subject in the wide-flung curriculum of the modern school that is more able to *do something* than industrial arts. It is of the substance of the *learning by doing* which some philosophers feel is the answer to many of the problems in education. It has the seeds of the cultural inheritance of the past, yet it partakes of the *scientific method*. It is vital and alive. It is practical.

But if industrial arts is to come into its own, it must cooperate with the entire school. The subject must assume a leadership in the planning of the school curriculum. It must take the burden of the changes that are occurring. It must lead in the new trends in education.

It is well for the instructor of industrial arts to examine some of the more important of these trends in order to determine his constructive role therein.

Consolidated Schools

For the past several years, there has been a well-defined movement to mold schools into larger administrative units. The consolidation of smaller schools, and the centralized school in rural areas has advanced to a large degree throughout the United States though the trend is still in its primary stages. The little red schoolhouse of former days is passing away and the single-room or two-teacher school is being replaced by the modern building which serves a larger number of districts. It is needless to point out the reasons for this change. It is a condition that will continue.

With the enlargement in physical and administrative setups, there is a corresponding change in the school curriculum, a chance for art and music, larger libraries, for gymnasium facilities that have been denied heretofor. There is a real and growing demand for the subjects that will fit every pupil into a vital part of the school program and prepare him for participation in life of the community. Herein there rests a real challenge to the instructor in industrial arts. Not only must he *sell* the possibilities of his work to students who have been denied such opportunities in the past, but for this type of student, he must set up new objectives in his courses of study. In the past he may have thought of industrial arts as an orientation for the factory, now he must think of it as orientation for agriculture, leisure-time activities, industry as a whole, life itself. Industrial arts is just as useful in the rural school curriculum as the teaching of agriculture. Much of the work of the farmer must deal with the manipulative processes that are taught in the industrial-arts program. It is able to offer a constantly expanding field of service. Too, many of these new-type schools will need administration and supervision which is thoroughly sympathetic with the industrial-arts program. Such administration must be recruited from the leaders in industrial arts, who should take thought of their abilities and re-examine their objectives.

The New Schoolhouse

A second trend, which offers a challenge to the industrial-arts leader, comes with the thousands of new physical plants that are being erected throughout the land. The housing program that is being advocated throughout the nation has found corresponding response in the building of new schools. The outmoded fire traps of yesterday are being replaced by modern buildings. A casual observer might argue that this building activity is a politically inspired effort to aid the country in an economic way, but the more thoughtful person will realize that it is a trend which is bound to continue for a number of years. If the Federal Government discards such a program — an unlikely event — the state governments will enter with some form of subsidy for the poorer school districts. One need not take issue with the critics that say that a school building program is a political expedient, for it is evident that the nation has now reached a point in its existence where such a program is imperative.

The democracy has come to the sharp realization that it must defend itself against a host of enemies. A temporary defense, in some minds, may take the form of huge armament programs. A more permanent defense will come only through an alert, educated citizenry which is firmly grounded in the meaning of democracy, which can fight and vote intelligently, citizens who are thoroughly convinced that they have found an acceptable pattern of life. So the sound of the hammer and the forge is heard in the land that these homes and schoolhouses — sinews of peace, may take their place with the sinews of war. There is, and will be, increasing attention paid to the physical needs of the schools in every state of the nation.

"But what has that to do with me?" asks the industrial-arts instructor. The answer is twofold. New modern buildings must be staffed with new modern curriculums. Planning and thought must enter into this building program if it is to meet the needs that called it forth. In the smaller school system of the country, who is better qualified to advise with the school administrator regarding layouts and plans for building programs than the worker in industrial arts? This reading of blueprints and planning of buildings should find him ready where his practical knowledge will be invaluable. Class projects in the layouts for new schools are not out of order. Administrators have long emphasized that the administration of democracy's schools should be a democratic process. How much value, then, must there be in giving the young people in the classroom a voice in the future home where they must work and study? Does this sound impractical? Probably so, to the city staff that has its corps of architects and planning boards. But not to the smaller school which is facing a building program for the first time in half a century or more.

Adult Education

Another trend in school affairs which the industrial-arts leader must enter is in the matter of the adult-education program. Just as the more formal education for youth has shown increasing signs of ferment and change, so has the attempt to open up new avenues in adult education become of primary interest and importance in the nation. In a thousand different ways throughout the land, educational leaders are attempting to meet a problem which has been ignored by the school. Public forums are springing up, evening classes are being organized, adults are coming back to school in increasing numbers. It is a healthy sign that democracy is aroused and fighting for its ideals as never before. Again, the Federal Government has stepped in to help with a movement which is vital to an intelligent democracy. But this movement in adult education has reached such proportions that it rests no longer on encouragement from any division of government, but arises from the people themselves.

Where does this adult-education movement point? Do these thousands of people who are returning to school come back to study the ancient curriculum which has been frozen into the formal day school? A limited number may do so, but adult education in many a community has been hampered and stifled because educational leaders have thought of it in the same old-fashioned pedagogical molds that have been placed around the children.

The adult-education movement refuses to recognize much value for the formalized curriculum of the day school. Where, then, do the people go? They hurry to the rooms that have been set aside for industrial-arts and vocational work. This one goes to school to gain knowledge of a leisure-time activity, this one to complete a gap in his training in mechanical drawing, this one for the pleasure of working on a hobby or to build up an activity for leisure time.

If the school is going to assume the leadership in the adult-education movement, it

must break away from tradition and expand its curriculum to include many so-called frills and fads that it never believed would be demanded of a tax-supported school. And the taxpayers themselves are demanding that the school assume this leadership. Industrial arts is peculiarly fitted for the leadership if the instructor is alert to these changing conditions and has secured a broad knowledge of the increasing demands that will be made in this field.

A further fact which industrial arts must recognize is that the trend toward vocational education in general is one of the fastest growing movements in the educational field. The larger unit of administration and the attempt to equalize educational opportunity for youth have brought and are bringing into existence more vocational high schools and more county-wide units of vocational education. Because of the new developments in technology and in general industry, the old apprenticeship system has largely disappeared. Longer periods of training under more acceptable working conditions and a greater realization of the obligation that the nation owes to its youth have been factors in a trend toward vocational education. Business and industry are calling with increasing insistence for operators in various fields who were formerly supplied by a system of trial and error, useful in the narrow phases of vocational work but far from conducive to well-educated citizens.

The Industrial-Arts Instructor's Opportunity

In addition to these larger trends in education there are a number of other educational movements which present a challenge to the leader of industrial arts. The so-called *consumer* movement, which is expressed in the increasing desire of the average citizen to know whereof he buys, how to get an honest dollar's value for the dollar he spends, and how to avoid being gulled by unscrupulous merchandising. Too, there are the labor movements which present a host of problems to the democracy and which cannot be ignored by the school; these developments are of significance in the field of industrial arts and he who would set himself up to guide the youth of a democracy cannot ignore them if he takes his leadership seriously.

"Why should I assume the leadership in these various changes in education that are bewildering many a more erudite scholar than myself," says the industrial-arts instructor. "These things are the business of school administrators who have more experience and greater knowledge of general educational affairs."

True, but these same developments look toward industrial arts for sympathetic leadership and we cannot fail them. No longer, Mr. Instructor, can you permit yourself to be set aside in one corner of the educational world, apart from the other links of the chain which must be forged to lift democracy to higher levels. Many times in the past, in despair at the lethargy of the educational world, you have complained that there seemed to be little future in the work that you had chosen for a life career. No longer can you make such a statement in good faith, for the educational world is presenting possibilities and challenges that are the greatest of any era in history.

"How should I assume that leadership?" By "thinking on these things," by re-examining and reconstructing your philosophy of education, by work and study, by reading professional magazines, by organizing or joining professional groups, both industrial-arts associations and other educational bodies; by re-evaluating the methods and materials and tools of instruction with which you work, by entering into the community life, by teaching children and not subject matter alone — all these things you must do for the sake of the profession to which you have given allegiance and for the sake of the democracy to which you owe your loyalty.

The leader in industrial arts must become the leader in all the educational forces which look toward the future. As he goes forward with his work, he may well repeat to himself a statement which to some may appear as a new philosophy:

"Recognizing that education is changing and expanding, that it must assume an ever more important place in the lives of both the children and the adults in a democracy, I shall prepare myself for future leadership by increasing my vision, my scholarship, and my efficiency. I shall consider myself not as an isolated individual engaged in a narrow subject field of teaching, but as a part of the great forces of education that must help make my country a better and safer place in which to live."

In this whole great business of education, industrial arts cooperates.

Industrial Change and the Teaching of Machine Drafting

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Mechanical drawing was a charter subject in the manual-training period of industrial education. Since the primary purpose of high-school courses in those days was preparation for college entrance, early curriculum builders adopted engineering-college course content, practices, and methods of teaching, modifying them to meet the abilities of secondary-school pupils.

Few changes were made in the teaching of drawing prior to the world war. Students drew a series of "plates" in pencil on detail paper (many or all of them later inked in) covering geometrical construction; third-angle projection; intersections and developments; pictorial representations of all kinds; fasteners; a few machine details; and, finally, a set of working drawings of a simple machine.

Too often most of this was mere copy work. Emphasis was placed very largely on shape description and technique. Dimensioning was hurried over as a necessary evil instead of being recognized as one of the most important phases of drafting. The teaching of drawing eventually became highly formalized.

About ten years ago a number of leaders in our field undertook to revitalize the teaching of elementary mechanical drawing. They broadened the subject to include many kinds of graphical representation, tied in architectural drawing, laid increased emphasis on related information, and minimized technique. The result was the "general mechanical drawing" with which all are now familiar. Like most reformers, they swung to the extreme opposite to that of the formalists.

Recently there has been a reaction against the loss of good work habits due to the attempt to cover too much ground in too little time. No doubt a median will be attained eventually. The net effect of this movement has been beneficial, especially in the junior-high-school level where drawing is taught primarily for general information and guidance values.

Very little has been done so far to revitalize senior-high-school machine drafting, taught in part or in whole for its vocational values. Teachers continue to tell their classes that drafting is the language of industry quite unaware that they are teaching a kind of industrial Anglo-Saxon. There are certain indications today, however, that school drafting practices in general and senior-high-school drafting methods of instruction in particular are due for an overhauling. What are the reasons for such revision and what direction will it take? We must look to industry for the answers to these questions.

Changes in Methods and Personnel

Until about the time of the world war, industry developed at a relatively leisurely pace and industrial drafting kept in step with this development. Since the war, however, changes in the methods of production

have occurred so rapidly that drafting practice for a time lagged behind and is only now getting back into step.

Formerly, a few relatively simple products were made year after year in a given factory, gradually evolving as improvements were suggested by the men who made them. Today, it is more common to find factories producing frequent models of many complex products which originate in the experimental, engineering drafting rooms and shops.

Not long ago castings, forgings, and mill stock of iron, steel, and brass made up the bulk of the material from which machines were made. Today these materials remain and many new ones have been added. Among these newcomers are aluminum, ferrous and nonferrous alloys, extrusions, die castings, plastics, weldings, and so forth.

Machine tools have likewise increased in variety, complexity, and precision. Instead of parts being produced by skilled mechanics operating lathes, shapers, planers, and milling machines and fitted together by hand at the bench or on the assembly floor, they are now largely made automatically or semiautomatically so accurately as to be interchangeable.

The erection shop remains in many plants; but it is supplemented if not replaced in many other factories by some form of the assembly line.

Personnel changes have naturally followed changes in machines and methods. Whereas skilled mechanics and laborers previously constituted the majority of the force, today semiskilled machine tenders and assemblers outnumber either of the former groups.

All of these changes have influenced industrial drafting. Draftsmen used to take into consideration the knowledge and intelligence of the mechanics who were to use their drawings. It was assumed, for example, that they knew what tap drill to use and how much to allow for a running fit. This is still true in tool drafting, but in production drawings nothing is now left to the imagination of the pieceworker.

Changes in the Drafting Room

Variety of output, yearly models, and the search for new products have increased the need for drawings. The last census shows that draftsmen are increasing in number faster than the population as a whole, but this increase would have been far greater had not industry simplified and standardized drafting practices, eliminated the tracer to a large extent, and introduced timesaving machines and methods.

Industry's adoption of the practice of making drawings on cloth, vellum, or bond from which blueprints can be made directly has caused changes in drafting equipment as well as in personnel. At least one of the pencil companies has brought out a pencil with lead of rectangular cross section which, when sharpened to a chisel point, permits the drawing of long, straight lines of uniform color and width. All of the leading drafting supply houses have recently brought out beam-compass sets. The beam compass allows the penciling of large circles and arcs dark enough for good blueprinting — something that has always been impossible with the common type of compass.

Where school finances permit, it is desireable that vocational students be familiarized with the use of drafting machines, parallel straightedges, lettering guides and pens, and the like. In any school, they should be instructed in the use of numbering systems; change columns; material, heat treatment, and operation specifications; and drafting-room organization.

Students should understand the principal machine tools and production methods. So important is this phase of their training that some employers require future draftsmen to spend months or even years in the shops before starting on the board. Since our students can spend but a limited time in related shopwork, field trips should be utilized to acquaint them with more advanced methods.

Punch-press dies, jigs, and fixtures play a large part in modern industry; and we should give students some work in this field.

Industrial change has made obsolete many of the old standard lines, sections, symbols, etc., and we should adopt the new national standard of *Drawings and Drafting Room Practice,* ASA Z14.1-'35. Dimensioning has been complicated by interchangeable-parts manufacture. *Z14* should be followed in precision dimensioning, as well as B4a-'25, *Tolerance, Allowance, and Gages for Metal Fits.* Other useful standards are: B1.1-'35, B5.10-'37, B17F-'30, B18c-'30, B18.3-'35, and Z14.2-'35. All may be obtained from the American Standards Association, 29 West 39th Street, New York, N. Y.

Welding has made many changes in manufacturing and added to the knowledge which draftsmen must possess by necessitating adoption of the American Welding Society's new symbols. The clearest exposition of these symbols will be found in the Carnegie-Illinois Steel Corporation's booklet *Welding Instructions and Standards, Part I, Symbols,* which may be purchased for fifty cents. The general offices of this company are in the Carnegie Building, Pittsburgh, Pa.

Much information as to new material, machines, and methods may be obtained from material distributed by advertisers in *Machinery* and the *American Machinist* magazines or from trade publications such as *Nickel Cast Iron News,* 65 Wall Street, New York City, *Modern Machine Shop,* 431 Main Street, Cincinnati, and *Tool-Die-Machine Progress,* 215 Fairmount-Cedar Bldg., Cleveland, Ohio. Some of these publications may be obtained free of charge.

Selection and Training of Draftsmen

Most of the foregoing relates to changes in drafting practices or to related information, but one of these changes should affect the selection and training of vocational drafting students. The practical abolition of the tracer should transfer the emphasis from skill of hand to skill with thought processes. There is no longer much future for the graduate who can make beautiful drawings but who cannot hope to become a designer.

We should select our vocational students as carefully and see that they get as good an education in English, mathematics, and the natural sciences as if they were engineering-college prep students. Industrial change has brought about social change, and our students should receive instruction in the social sciences to enable them to participate intelligently in the solution of the problems which they will face as soon as they enter the adult world. Furthermore, we should convince our graduates that they must continue their studies in evening school or college extension if they hope to achieve positions of responsibility and adequate remuneration.

While they are with us, they should be taught, first of all, the minimum essentials of drawing: lettering, lines, conventions, the theory of projection, dimensioning, and the like. Next they should be taught to visualize — and this cannot be done by copying or by handling models or machine parts. Two ways in which it *can* be done are by having students make working drawings from dimensioned pictorials and from dimensioned assemblies. Finally, they should be taught to design. This can only be done by assigning problems for them to work out by themselves with as little help from the instructor as possible. While they are learning to design they will also be learning all the other things a draftsman must know: materials, methods, and machines used in the manufacturing processes; the use of handbooks, reference books, data sheets; mechanisms such as, cams, gears, linkages; elementary strength of materials; and drafting-room organization. Since the drafting teacher cannot hope to know all of the answers, his students will learn how to "win friends and influence people" while interviewing mathematics, science, and shop teachers and men in local industries. Even their English may be improved if they are supervised while writing for information to chief draftsmen or chief engineers of manufacturing companies.

The best possible opportunity to develop the ability to design is found where the various shops cooperate in building tools, machines, and equipment for school use. Where this is impossible, the teacher can usually obtain help from professional draftsmen in evaluating the worth of the finished set of working drawings.

It will be impossible to add to our present course of study all of the new material and methods just mentioned. We must evaluate what we now teach, abandon that which is obsolete, add new units of instruction, devote less time to elements of minor importance, and give more time to units of greater importance. The best way to judge the adequateness of our teaching is to place our graduates, follow up their progress on the job, and evaluate our success by the successes of our products.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Thinking Safety

The teachers of industrial arts and vocational education must always have the idea of safety uppermost in their minds and they must also impress their students with the importance of thinking safety.

Many shop teachers take their safety instruction very seriously. They make use of every known method of making their students safety conscious. But usually this safety instruction is quite closely related to but one shop subject or at best to the three or four subjects embraced in the shop curriculum. That this is not always sufficient is made evident by the following list of accidents which appeared under the heading of "Miscellany" in the September, 1939, *Chemical Safety Bulletin,* published by the National Safety Council, Inc., 20 N. Wacker Drive, Chicago, Ill.

A worker was severely burned about the face and chest when a lead pot, with which he was working, exploded.

An employee of a dairy company was severely burned when hot babbitting which he was pouring into a mold, exploded in his face.

A garage owner was killed by the explosion of a gasoline tank on which he was doing some electric welding.

A mechanic was killed and another man severely injured when an oil tank exploded during welding operations.

A man was killed and his sister seriously injured by an explosion of naphtha fumes. A vacuum cleaner was used in a closed room after cleaning a rug with the naphtha.

A laboratory assistant turned a 200-pound pressure steam line into a copper steamjacket cooker designed for a pressure of five to ten pounds. The resulting explosion injured him seriously.

Frequently, similar diverse activities are carried on in school shops. On the spur of the moment a boy or even the teacher may have to do something which is out-of-the-ordinary school routine and thoughtlessly set up conditions which may bring suffering and even death to the perpetrator of the deed as well as to others.

For this reason, teachers and shop students will do well to read and discuss accidents, such as those mentioned, so that they may develop an analytical and planning attitude toward safety on all jobs, even those which fall outside of the accustomed routine.

Pay Dirt

The old-time gold miners knew the meaning of the expression, "pay dirt" very well. To them it meant the realization of the hopes which had tempted them to undergo privations, hardships, and extreme danger. It meant also the promise of wealth about which they had done so much wishful thinking.

Pay dirt was just as dirty and as hard to handle as was the dirt through which they had so laboriously worked their way in search of gold, but pay dirt was greeted with cheers of delight, because it, unlike the common ground or dirt which these men had shoveled, contained the valuable particles of gold for which they were seeking.

Modern youth, too, should accustom itself in its study of vocational statistics and information to be discerning whether the presence or absence of dirt in a given occupation or trade may not mean exactly what the presence or absence of pay dirt meant to the gold miner of the forties.

The absence of dirt in the white-collar job frequently also means the absence of commensurate pay, while the comparatively dirtier trades and occupations, though less appealing from the esthetic aspects, may offer worth-while returns to those who are not afraid to soil their hands in an effort of making a living.

As business and industry slowly recovers, it is quite apparent that the skilled trades will have much to offer to those who have acquired the knowledge and skills which these trades require. The dirt seen on the hands of some of these skilled workmen may look abhorrent to the student, but he should not forget that it is pay dirt.

In spite of the gloomy prognostications so often heard that industry is changing rapidly and that it has become so mechanized that it is foolish for the young to learn a trade, skilled men are now more than ever in demand, and the ambitious should still pin their faith on an education that prepares them to assume their position among the workers as skilled men who can combine the theoretical and the practical and who, in spite of their dirty hands, are earning a good livelihood in a highly respectable way.

Writing Legibly

Recently a state supervisor of vocational and adult education related that he had received nineteen reports from a certain school, all signed by one instructor. The name on the top card was illegible, so the second one was inspected. That, too, was indecipherable. Careful scrutiny of the signature on each of the nineteen cards did not disclose the name of the instructor who had signed the reports. A letter had to be sent to his school in order to find out who had signed the papers.

This, no doubt, was embarrassing to the teacher, and yet, he is not alone in the poor handwriting class. The signatures on the letters of many of our educators are indecipherable. Just why men, who insist that their students strive for perfection in all of their schoolwork, should permit themselves to turn out work that could receive no grade higher than failure, is hard to understand. Those indecipherable signatures represent not only poor work, but work that ought to be rejected.

Probably there is some truth in the remark that in this age of typewriters one needs to spend less time in developing the ability of writing a fine hand. Nevertheless, an illegible signature is unforgivable even if one can point out many men prominent socially and professionally who affect signatures which are scrawls more than writing. A poorly executed signature proclaims to all who care to look at it that the writer has failed to acquire a skill which is of much importance.

Teachers especially should be careful not to make an error in judgment by permitting an illegible signature to represent them before their students or before others. It takes but a little practice to overcome the slovenly habit of signing things with a poorly written name. It is well to remember that a signature represents a personage in a most significant way. Let that representation be at least presentable.

Turning Toward Tomorrow

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Turning the lure of the future and our knowledge of the past into an urge for bettering ourselves.

The Lure of the Way Ahead

The child who started picking flowers at the edge of the woods was attracted by a blossom which looked a little more beautiful in the setting of a shady glen. No sooner had she reached it, however, than her heart was thrilled by still more mystic wonders beyond. And so she was led farther and farther into the depths of the forest. In a fairy tale thus begun, the way may lead to no end of imaginary wonders.

In actual life we are too likely to dismiss such a fantastic tale with the conclusion that it has no application in practical life. But still we are continually lured ahead by what we believe or imagine to be in store for us. The winding mountain road is alluring because of the uncertainty of what each new turn may reveal. The coming of a holiday is anticipated with joy because it holds an element of thrilling uncertainty not found in the regular working day.

One of the reasons why youth is a phase of life so greatly coveted is because at that time in life there seems to be so much ahead to live for. The drabness of age comes largely from a constantly diminishing outlook, but does not come to those who keep their faces forward and their senses alert. Each new day offers the opportunity for a new beginning, and once each year humanity has a world-wide thrill as it pauses on the threshold of a new year. Since the year is a cycle, any other day should serve just as well for the beginning of a new year, but to feel that all the world is looking ahead at once carries an added thrill.

A Stimulus to High Endeavor

Like many other potential forces, the lure of the unknown which lies ahead may lead upward or downward; it may prove to have beneficial or detrimental results; it may end in goals which are desirable or disastrous. Accordingly it is not the lure itself, nor its attendant momentary thrill that is to be sought, but rather the stimulus of these forces toward worthwhile endeavor.

In the regular round of everyday affairs too little account is taken of the potency of tomorrow's lure. Probably one of the greatest stimuli to energetic service today is the expectation of the results which may be produced therefrom tomorrow. The student studies today in order that he may gain knowledge, and use it to best advantage tomorrow; the craftsman plies his skill today to the end that his fellow men may have his products to use tomorrow, and he may receive a just wage in return for his labors; the farmer plants seeds today in the hope that he may reap tomorrow; and the teacher serves today that there may be an educated people tomorrow.

Such activities as these are constructive, and usually rich and fruitful, because of their very nature, but the same attitude of mind commonly attends activities and situations bearing fewer rewards within themselves. If life seems drab, uninteresting, monotonous, difficult, hard to bear, or painful today, we look forward to some time, event, or situation in the future when we believe conditions will be improved.

Thus if our lot seems bad today we are spurred to action by the possibility that such action may help to make it better tomorrow. And if our lot is good we have the same urge to action that it may be even better tomorrow. These innate urges of mankind are evidently toward an ever higher state rather than a lower. Lack of accomplishment results from failure to follow their lead.

Gleanings from the Past

A disproportionate sense of relationship between the past and the future may be the fundamental cause for inadequate accomplishment in life. We seek success, but a past filled completely with success does not always prepare us best to face the future successfully. We must have had enough success to acquire the feel of it, and recognize its values through personal experience. But we should have come close enough to failure now and then to help us realize the struggle necessary to overcome it. Without some failures mixed with the successes of the past, the successes of the future will be less brilliant, and the failures or difficulties which are sure to come will hit us harder and be more likely to deal us a knock-out blow.

Carrying the experience or habits of yesterday over into tomorrow is not greatly different in nature from attempting to preserve material wealth or possessions. The accumulation of any value or commodity counts for nothing except as it may be utilized at some time or in some situation when it is needed. Likewise to carry over an accumulation of useless ballast only weighs down the sojourner and constitutes a force for degradation and failure.

Saving too little from yesterday is probably a more common error than saving too much. What can you say you have saved from yesterday? Have you saved any energy, any strength, any enthusiasm? Have you saved any money, anything to do, any new places to go? Have you saved any thrills, or any pleasures to anticipate? Or have you spent most of these things prematurely?

Overexpenditure of energy yesterday means exhaustion tomorrow. Overeating yesterday, when the supply was limited, means starvation tomorrow. Overexcitement yesterday means shattered nerves tomorrow. Overspending of money yesterday means poverty tomorrow. To have sought and felt all the thrills within reach yesterday means emotional depression tomorrow.

In the field of intangible things it is sometimes hard to comprehend the inevitability of these relationships, but observation in the material realm sometimes presents a more vivid picture. Now and then in the classroom it is difficult to understand why it matters so much if the lesson of yesterday was not thoroughly prepared in language, mathematics, history, or science. But in the shop each day's accomplishment bears *visible* evidence of progress toward the goal of a completed project, and without it tomorrow's work cannot be done.

The New Year is a traditional time for good resolutions, which carries two distinct implications. First there is the implication that we have made some mistakes in the past, which we seek to correct. But the implication of much greater worth is that from the experience of the past we have gained some conceptions of thinking and acting on higher levels of attainment. Is your outlook for tomorrow any different because of what you have gleaned from the experience of yesterday?

Proceeding with Confidence

The coming of 1940 is heralded as the opening of a new year, but we shall have to take it, as we have taken 1939 and all other past years, a day at a time. A year is lived a day at a time, just as a drawing is made a line at a time; an edge is planed a shaving at a time; a picture is painted a stroke at a time; a meal is eaten one bite at a time; and a book is written one word at a time.

As the student in school ponders on tomorrow he makes some plans as to his procedure. He plans to prepare lesson assignments more thoroughly, and to make a better recitation. In his shopwork he is resolved to make a joint which is more nearly perfect, to turn a taper with less variance from the specifications, and to produce a finish on wood or metal which shall help preserve the surface and be pleasing to the eye.

If these plans shall not have been made in vain some realities saved from the past will have to be carried into the performance of tomorrow. In almost any field of

endeavor these realities must take the form of specific knowledge and skills. The knowledge required varies all the way from that which is partially abstract to that which has to do with measurable quantities and manipulative processes. The skills likewise vary from skill in the use of ideas to skill in the use of tools and machines. In the new year just opening there will be greater demand than ever before for the use of these two realities and the rewards will come to those who possess them.

The unqualified preparations and plans we have made for the morrow indicate without question our *faith* that tomorrow will come. May we approach it with bright *hope* that there will be abundant opportunity to utilize the knowledge and skills we have laid in store. And may the utilization of our talents bear tangible evidence of *love* for our fellow men.

Job Activities in Publishing and Printing

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A comprehensive job study which deserves emulation by teachers in other fields of industrial arts and vocational education.

Education in a democracy must provide experiences which enable individuals to become effective in all aspects of living. Analysis of the attributes of effective living makes apparent the role of economic status in achieving personal competency in life. There is the need then for schools to make available experiences, among others, which are basically occupational in nature and through which the individual achieves the skills, understandings, and attitudes necessary for effective functioning within a particular occupation area.

This in no sense means that the total program of any school should be developed in terms of specific trade training or solely on the basis of generalized occupational experiences. Rather does it imply that effective educational experiences demand that schools recognize occupational experiences as an integral part of their total program. Unless this concept is grasped and understood the resultant effect will be to deny many youth experiences in areas of living which are not necessarily occupational in nature.

What the experiences in these various areas should be the Rochester Athenaeum and Mechanics Institute believes can be best established by examination of society in relationship to the needs of youth and discovering the activities necessary to a fruitful and ever expanding way of life. Through such a technique it is possible to provide in all curriculum content, experiences based upon the utility and importance of the experience as evidenced by the requirements of contemporary society for competent living.

The technique of analysis has been used at the Institute in developing a broad program of education, in which technical and nontechnical experiences are so related, that students progressively move toward a personal integration, in which competency, for achieving economic status, plays its part in making the student become increasingly significant as a person.

Most recently the technique has been utilized in establishing a base for technical experiences in the occupational area of publishing and printing. This report presents the findings of a functional survey in the letterpress aspect of publishing and printing as distinguished from that of newspaper publishing. These materials are used at the Institute in developing only one general portion of the total curriculum for students interested in this field. The Institute holds no brief for narrow trade-training curriculums and believes that any program of education so conceived falls short of what education should be.

Activity lists for workers in the printing fields, grouped by jobs, were prepared by:

1. Introspection on the part of teachers in the department.
2. Interviewing and observing workers in the profession.
3. Consideration of activity analysis found both in printing and general technical literature.
4. Analysis of equipment in plants and in laboratory.
5. Review by executives.

The initial lists were then checked by workers on the various jobs for completeness of activities listed. Following this check, the materials were incorporated in questionnaire form and provision made for indicating the relative importance of each activity. Meanwhile, letters requesting cooperation in the study were sent to men known to be interested in printing education and men in shops known to be capable of offering authoritative opinions in all departments. Enclosed in the letter was a post-card request for duty lists, and upon receipt of this card the duty lists were sent out with the suggestion that men actually employed upon the particular job check the list for that job, for completeness of duties, and the relative importance of each duty. The tabulations which follow present the average weighting of importance for each duty. A four-point scale was used for this purpose. A weighting of one indicating the activity to be unnecessary, two indicating the activity to be of little importance, three indicating the activity to be essential, and four indicating the activity to be very important. From experience we found that twenty-five returns were sufficient for our purposes and additions did not add materially to the findings.

Duties Fundamental to All Jobs

1. Seek knowledge for the improvement of all processes relating to the duties involved through experimentation, study, and through the reading of trade journals and books.
2. Handle all details of a job so that the firm's reputation for quality work will be enhanced.
3. Help in all ways to produce printing jobs by careful, quick, and accurate work.
4. Keep machines and tools in good condition by proper care, by oiling, cleaning, and adjusting properly.
5. Avoid waste in materials.
6. Avoid the waste of time by proper scheduling and by providing sufficient materials and adequate tools.
7. Maintain accurate time records on each job, and for nonchargeable time.
8. Cooperate with fellow workers and the management in the prevention of accident and health hazards in the printing plant.
9. Be on the job — come to work on time, and do not loiter during working hours.
10. Seek a worthy use of leisure time.
11. Cooperate with others — be a willing worker.
12. Assist in the training of apprentices.
13. Be loyal to your employer.

Analysis and Weighted Importance of Job Duties

Duties	*Weighted Importance*
Bookbinder	
1. Handle sheets of paper carefully	3.5
1.1 Before printing	3.4
1.2 After printing	3.4
1.3 In jogging	3.4
1.31 By hand	3.2
1.32 By machine	3.
1.4 In counting	3.6
1.5 In cleaning	3.6
2. Fold	3.6
2.1 By hand	3.
2.11 Fold to paper	3.1

Duties	Weighted Importance
2.12 Fold to register	3.7
2.13 Right angle	3.2
2.14 Parallel	3.
2.2 By machine on:	
2.21 Dexter	2.6
2.22 Cleveland	2.5
2.23 Baum	2.6
3. Tip and paste	3.3
3.1 By hand	3.4
3.2 By machine	3.2
4. Gather	3.6
4.1 By hand	3.5
4.2 By machine	3.2
5. Collate	3.7
6. Sew	3.7
6.1 By hand	3.
6.2 By machine	3.4
7. Stitch and staple	3.
7.1 Side wire	3.
7.2 Saddle wire	2.7
8. Bundle	2.5
8.1 Smash by hand	3.
8.2 Smash by machine	2.6
8.3 Operate signature or bundling machine	2.5
8.31 By hand	2.3
8.32 By power	2.3
9. Trim with:	
9.1 Hand cutter	3.6
9.2 Power cutter	3.7
9.3 Automatic trimmer	4.
10. Round	3.
10.1 Hand	3.3
10.2 Machine	3.6
11. Back	3.5
11.1 Hand	3.6
11.2 Machine	3.6
12. Line-up	3.5
12.1 Hand	3.6
12.2 Machine	3.5
13. Gild	3.3
14. Marble	3.
15. Case	4.
15.1 Hand	4.
15.2 Machine	3.6
16. Stamp	4.
16.1 Hand	3.6
16.2 Machine	3.6
16.3 Lay the gold	3.6
16.4 Emboss	3.6
17. Index	3.3
18. Mail	2.5
19. Operate	3.
19.1 Numbering machines	3.
19.2 Paging machine	3.3
19.3 Ruler	2.6
19.4 Perforator	3.2
19.5 Punching machine	3.2
19.6 Paper drill	3.3
20. Cut paper	3.
21. Pad and tab	3.2
22. Mix paste	3.
23. Mix glue	3.
24. Develop good knowledge of paper	3.5
24.1 Kinds	3.3
24.2 Grain	3.3
25. Develop a general knowledge of:	
25.1 Presswork	3.
25.2 Composition	2.6
26. Index	3.2
27. Stamp with full face dies	3.
28. Make dummy copies	3.
29. Smash uniformly	4.
30. Cut board uniformly	4.
31. End sheets with cloth	3.5
32. Cut stock to best advantage	4.

Composing-Room Foreman

General Requirements	
As an executive — on the job	
1. Analyze job for planning; organize work	3.9
2. Be prompt in work — get things done on time	3.8
3. Be interested in your job	3.8
4. Practice and teach safety habits	3.6
5. Obey all rules of the shop — set the example	3.7
6. Develop personality through recreation, intellectual, and social contacts	3.
7. Co-ordinate work with other departments	3.7
8. Report inefficiency	3.1
9. Keep department in order — be systematic	3.6
10. Check all details of department	3.6
11. Be pleasant, friendly, courteous — hold temper	3.4
12. Keep posted on printing progress — read the trade journals, attend professional meetings	3.2
13. Do what you expect of your men — be a leader	3.8
14. Economize on materials and labor	3.6
15. Avoid "passing the buck"	3.2
16. Supervise and instruct men	3.7
17. Keep in a healthy condition	3.6
18. Practice keeping within bonds of own authority	3.3
19. Develop and train employees	3.7
20. Keep all promises made to employees	3.6
21. Keep confidences of workers	3.5
22. Avoid familiarity	2.8
23. Play no favorites — break up cliques	3.4
24. Place men in positions according to their ability and special qualifications	3.8
25. Energize men	3.6
26. Instill loyalty to management in workers	3.6
27. Reduce labor turnover to a minimum	3.5
28. Select competent men	3.5
29. Explain company policies	3.4
30. Interpret management to men	3.5
30.1 Be friendly toward employees	3.1
31. Keep on friendly terms with unions in regard to:	
31.1 Chapel rules	2.3
31.2 Wage scales	2.7
31.3 Overtime	2.5
31.4 Priority rules; care of old employees	2.5
32. Study traits, ideas, and efficiency of all help	3.4
33. See that men are trained on new and improved machines	3.1
34. Set up nonfinancial incentives to learning	3.2
35. Train an assistant	3.7
36. Inform management of men showing promise of leadership	3.5
Economic Responsibilities	
37. Adapt jobs to proper machines	3.8
38. Train men in various machine operations on machines	3.1
39. Lay out work for employees	3.7
40. Conserve power, light, gas	3.4
41. Keep records and reports on:	
41.1 Attendance	2.5
41.2 Shop trouble and difficulties	2.5
41.3 Shortages	3.1
41.4 Check workers' individual work in quality and quantity	3.6
42. Improve production methods	3.6
42.1 Improvement in operation	3.7
42.2 Specify mechanical equipment	3.4
42.3 See that equipment is maintained properly	3.7
42.4 Develop standards for selection and testing of machines and materials	3.3
42.5 Store and check incoming materials	3.3
42.6 Provide for protection of materials and machines	3.2
43. Keep quality of work up to standard	4.
44. Confer continually with rating production schedule	3.3
45. Kill, distribute or return metal to service houses	3.
46. Receive metal from service house and supply houses, record and store.	3.2
47. Keep time tickets	3.1
48. Record charges	2.9
49. Order supplies	3.3
50. Record all standing matter	3.2
51. Order duplicate printing plates, electrotypes, etc.	3.2
52. Order engravings	3.7
53. See that all compositors are well supplied with all necessary spacing materials and type	3.7
54. See that dead forms are unlocked and distributed	3.2
55. Handle cuts	3.4
55.1 File	3.2
55.2 Record deliveries	3.2
56. Keep metals from being mixed	3.5
57. Set production standards on quantity and quality	3.5
58. Confer with and assist salesmen on orders	3.
59. Confer with supplies and equipment salesmen	2.9
60. Contact customers:	2.6
60.1 In person	2.6
60.2 By telephone	2.4
60.3 Transcribe details and alteration on work	2.8
61. Create dummies to help in getting business	3.5
62. Lay out and specify type and composition to be furnished by service and supply houses	3.6
63. Make paste-ups for "blow-ups" and all other type of copy for engravers	2.9
64. Make up finished dummies for customers' O.K.	3.
Technical Duties	
65. Work on copy	3.1
65.1 Lay out	3.7
65.2 Fit	3.7
65.3 Mark up for composition	3.7
65.4 Edit	2.3
66. Work on proofs	2.6
66.1 Read galley proofs	2.8
66.2 Correct	3.
66.3 Check revise proofs	3.6
66.4 Make final press proof O.K.	3.6
66.41 For position	3.7
66.42 For color	3.1
67. Pass on imposition and positioning for:	
67.1 Folding	3.7
67.2 Die cutting and cutouts	3.2
68. Lock up for every type press with use of:	
68.1 Regular equipment	3.5
68.2 Patent base	3.4
69. Register color work	3.7
70. Lock up for foundry	3.2
71. Maintain production standards	3.8
72. Develop an understanding of operation and production of composing machines	3.6
72.1 Linotypes	2.7
72.11 All-purpose Linotype	2.4
72.2 Intertype	2.5
72.3 Linographs	2.2
72.4 Monotypes	3.1
72.41 Composition caster	3.
72.42 Material maker	2.8
72.43 Sorts caster	2.9
72.44 Giant caster	2.6
72.5 Elrod	2.4
72.6 Thompson typecaster	2.4
72.7 Ludlow	2.6
73. Develop an understanding of skillful and accurate operation of:	
73.1 Platen presses	2.7
73.11 Chandler and Price Open	2.3
73.12 Rice	2.
73.13 Kluge	2.3
73.14 Colt's Armory (National)	2.3
73.2 Cylinder presses	2.6
73.21 Kelly	2.7
73.22 Miller	2.3
73.23 Miehle	2.7
73.231 Vertical	2.4
73.232 Horizontal	2.1
73.24 Babcock	2.1
73.25 Lee	1.8
74. Develop an understanding of skillful and accurate stereotyping	2.6
74.1 Mat rolling	2.4
74.2 Casting	2.4
74.3 Blocking	2.6
75. Develop an understanding of skillful and accurate machine maintenance	2.7
75.1 Linotype, etc.	3.1
75.2 Press	2.
76. Develop an understanding of skillful and accurate hand assembly and composition of:	3.8
76.1 Commercial composition	3.6
76.2 Book composition	3.7
76.3 Catalog composition	3.7
76.4 Tariff pages	3.1
76.5 Magazine	3.5
76.6 Newspaper	2.7

Copyholder

1. Read copy aloud to proofreader	3.9
2. Hold copy to proofreader's reading	3.2

Duties	*Weighted Importance*
3. Keep copy in order	3.3
4. File copy	3.
5. Use proofreader's marks	3.2
6. Send out proofs and copy to customers or advertisers	2.4
7. Revise proofs	3.
8. "Collate" (read proof alone)	2.
9. Attain a working knowledge of printing processes	2.4
10. Hold copy on foreign languages	1.6
11. Develop a familiarity with community life — names, position, titles of important positions	2.3
12. Divide words properly and appropriately	
13. Use good grammar	
14. Note all misspelled words in copy	

Cutter

1. Estimate amount of stock for a job	3.1
2. Check estimator's figures on cutting	2.9
3. Cut stock	3.9
3.1 All types of paper	3.7
3.2 All types of board	3.6
3.3 All types of binder's cloth, etc.	2.6
4. Trim	3.4
4.1 Pamphlets	3.
4.2 Booklets	3.9
4.3 Books	2.7
5. Recognize paper stocks of various kinds	3.2
5.1 Basic weights	3.
6. Load stock	2.7
7. Uncrate stock	2.7
8. Store stock	2.6
9. Attain general knowledge of operation of:	
9.1 Platen presses	2.2
9.2 Cylinder presses	2.2
9.3 Bindery work	2.7
10. Back trim to eliminate fuzz	3.5
11. Square a sheet	3.9
12. Test for grain of sheets	3.7
13. Pad	2.5
14. Punch, perforate, and drill stock	2.5
15. Maintain an accurate perpetual inventory of stock	2.5

Cylinder Pressman

1. Square a sheet accurately	3.5
2. Line up bookwork accurately	3.
3. Put packing on cylinder presses properly	3.8
4. Make proper press adjustments	3.8
4.1 Set grippers accurately	3.7
4.2 Set stripper fingers accurately	3.7
4.3 Adjust shoofly fingers accurately	3.7
4.4 Adjust guide drop tongues accurately	3.6
4.5 Set drop guides accurately	3.7
4.6 Set rollers accurately	3.9
4.7 Set auxiliary distributor accurately	3.6
4.8 Set fountain accurately	3.8
5. Lock up forms properly	3.
5.1 Impose pages	2.3
5.2 Plan down	3.1
6. Do make-ready properly	4.
6.1 Hand-cut overlays	3.8
6.2 Chalk overlays	3.1
6.3 Biscuit overlays	2.4
6.4 Cameo overlays	2.
6.5 Zinc overlays	2.5
7. Get form O.K'd	3.5
8. Maintain accurate records on:	
8.1 Consumption of ink	
8.2 Number of impressions of each press per day	
8.3 Amount of spoilage	
9. Register accurately	4.
9.1 Forms	3.7
9.2 Color	3.7
10. Slit to register	3.7
11. Do color work	3.5
11.1 Two-color work	3.2
11.2 Three-color work	2.8
11.3 Four-color work	2.8
12. Take care of rollers	3.6
13. Print two colors on one-color press	3.1
14. Overcome offset	3.8
14.1 Use offset gun	3.4
15. Eliminate static	3.5
16. Remedy workups	3.4
17. Remedy wrinkles	3.7
18. Attain knowledge of air conditioning	3.
19. Remedy slurs	3.7
20. Remedy roller troubles	3.7
21. Eliminate fuzz	3.1
22. Set plates on base to register	3.5
23. Make minor plate repairs	2.9
24. Block out with borders	2.
25. Print on odd-shaped and special stocks	2.9
25.1 Cellophane	2.3
25.2 Glassine	2.4
25.3 Gummed stocks	2.7
25.4 Wrappers	2.8
26. Emboss on cylinder	2.2
27. Hot-plate emboss and panel	1.8
28. Cold emboss and panel	2.1
29. Die-cut on cylinder	2.4
30. Perforate on cylinder	3.2
31. Attain a good knowledge of ink	3.8
31.1 Match color accurately	3.7
31.2 Mix ink correctly	3.3
31.3 Use opaque inks	3.3
31.4 Use transparent colors	3.2
31.5 Choose correct ink for any job	3.7
31.6 Use metallic inks	3.1
32. Estimate ink coverage	2.5
33. Double roll	2.4
34. Wash up	3.1
35. Attain general knowledge of:	
35.1 Offset	2.6
35.2 Intaglio	1.4

Estimator

1. Keep up on changes of cost and maintain a file on cost of:	
1.1 Paper stock	3.8
1.11 Print or poster	2.8
1.12 Book	3.7
1.121 Laid	3.2
1.122 Wove	3.5
1.123 Antique	3.2
1.124 English finish	3.3
1.125 Enameled	3.7
1.126 Sized and supercalendered	3.3
1.13 Sizes	3.5
1.14 Grades	3.5
1.15 Basic weights	3.5
1.16 Figuring for cutting	3.7
1.17 Cutting	3.3
1.18 Grain	3.5
1.19 Bonds, ledgers	3.3
2. Estimate accurately and maintain a shop cost system on composition	3.6
2.1 Linotype, Intertype, Linograph	3.2
2.2 Monotype	3.2
2.21 Composition caster	2.8
2.22 Giant caster	2.5
2.23 Sorts caster	2.3
2.24 Material maker	2.
2.3 Hand composition	3.5
2.4 Ludlow	2.7
2.5 APL	2.2
3. Estimate accurately and maintain a shop cost system on make-up of:	
3.1 Catalogs	3.3
3.2 Advertisements and advertising pieces	3.2
3.3 Tariff work	1.5
3.4 Pamphlets	3.5
3.5 Bookwork	3.2
4. Estimate accurately and maintain a shop cost system on correcting	2.3
4.1 Proofreading	2.
4.2 Revising	2.2
4.3 Corrections	2.3
5. Estimate accurately and maintain cost-finding systems on presswork	3.5
5.1 Cylinders	3.5
5.2 Platens	3.5
5.3 Rotaries	1.8
5.4 Make-ready of all types	3.5
6. Estimate accurately and maintain cost-finding systems on bindery work	3.5
6.1 Folding	3.6
6.11 Hand	3.2
6.12 Machine	3.6
6.2 Gathering	3.2
6.3 Punching and drilling	3.
6.4 Reinforcing	3.
6.5 Round cornering	3.
6.6 Sewing	2.2
6.7 Stapling and stitching	3.2
6.8 Stringing	2.6
6.9 Stripping	2.2
6.10 Tieing	2.2
6.11 Slitting	2.
6.12 Tipping and tipping-in	3.2
6.13 Trimming	3.4
6.14 Wrapping	2.4
6.15 Numbering	2.8
6.16 Mailing	2.4
6.17 Ruling	2.
7. Estimate accurately and maintain cost-finding systems on engravings	3.3
7.1 Halftones	3.5
7.2 Zinc etchings	3.5
8. Estimate accurately and maintain cost-finding systems on duplicate plates	3.3
8.1 Electrotypes	3.5
8.2 Stereotypes	2.5
8.3 Wax engravings	2.5
9. Estimate accurately and maintain cost-finding systems on layout	2.8
10. Estimate accurately and maintain cost-finding systems on offset printing	2.3
10.1 Platemaking	2.8
10.2 Presswork	2.8
11. Estimate accurately and maintain cost-finding systems on gravure	1.8
11.1 Cylinder etching	1.8
11.2 Presswork	2.
12. Estimate accurately and maintain cost-finding systems on other intaglio	1.7
12.1 Copper and steel-die printing	1.8
13. Figure hour rates of operations in plant	3.7
14. Use estimate blanks	3.7
15. Estimate inks	3.3
15.1 Kinds	3.4
15.2 Coverage values	3.4
16. Estimate prices of all kinds of jobs (within scope of plant)	3.7
17. Plan jobs through process	4.
18. Purchase materials	4.

Hand Compositor

1. Set by hand all types of commercial printing:	
1.1 Advertising pieces	3.4
1.2 Newspaper and magazine ads	2.9
1.3 Tariff work	2.4
1.4 Rule forms and tabular matter	3.3
1.5 General run of commercial work (stationery, handbills, letterheads, blotters, etc.)	3.8
1.6 Booklets	3.2
1.7 Office forms	3.5
1.8 Newspaper make-up	2.3
1.9 Catalog make-up	3.2
1.10 Book make-up	3.1
2. Assemble all types of machine-composed commercial printing:	
2.1 Advertising pieces	3.5
2.2 Newspaper and magazine ads	3.
2.3 Tariff work	2.5
2.4 Rule forms and tabular matter	3.5
2.5 General run of commercial work (stationery, handbills, letterheads, blotters, etc.)	3.5
2.6 Booklets	3.8
2.7 Office forms	3.5
2.8 Newspaper make-up	2.8
2.9 Catalog make-up	3.4
2.10 Book make-up	3.2
3. Lay out all types of commercial printing	
3.1 Advertising pieces	3.
3.2 Newspaper and magazine ads	2.5
3.3 Tariff work	2.3
3.4 Rule forms and tabular matter	2.6
3.5 General run of commercial work (stationery, handbills, letterheads, blotters, etc.)	2.3
3.6 Booklets	2.3
3.7 Office forms	2.5
3.8 Newspapers	2.3
3.9 Catalogs	2.3
3.10 Books	2.1
4. Mark up copy for machines:	
4.1 Linotype, Intertype, Linograph	2.6
4.2 Monotype composition machine	2.9
4.3 Ludlow	2.2
5. Take proofs and correct	3.3
6. Distribute:	
6.1 Into cases	3.6
6.2 Break up machine-set matter	2.7
7. Lock up for:	

Duties	Weighted Importance
7.1 Platen press	3.1
7.2 Cylinder press	3.7
8. Do imposition on:	
8.1 Four-page forms	3.6
8.2 Six-page forms	3.4
8.3 Eight-page forms	3.6
8.4 Twelve-page forms	3.6
8.5 Sixteen-page forms	3.6
8.6 Twenty-four-page forms	3.3
8.7 Thirty-two-page forms	3.3
8.8 Sixty-four-page forms	3.1
9. Break forms for color	3.7
10. Operate of composing-room machinery:	
10.1 Ludlow	2.1
10.2 APL	1.8
10.3 Linotype, Intertype, Linograph	2.1
10.4 Monotype	2.
10.5 Elrod	1.7
10.6 Rotary miterer	2.5
10.7 Hand miterer	3.
10.8 Saw trimmer	2.7
10.9 Line-up and register table	3.2
11. Do pre-make-ready and type high mounting of plates:	
11.1 Type-high gauges	3.1
11.2 Type-high planers	2.7
12. Make use of artistic ability in composing of type	3.6
13. Practice the use of good grammar and English	3.3
14. Attain a general knowledge of presswork on:	
14.1 Platens	2.7
14.2 Cylinders	2.7
14.3 Rotaries	2.4
14.4 Lining up forms	3.3
14.5 Make-ready	2.3
15. Keep timekeeping records	2.6
16. Develop an understanding of the product of:	
16.1 Linotype, Intertype, Linograph	2.7
16.2 Monotype	3.3
16.3 Ludlow	2.7
16.4 Elrod	2.7
16.5 APL	2.6
17. Develop an understanding of printing plates:	
17.1 Electrotypes	3.1
17.2 Stereotypes	2.4
17.3 Photoengravings	3.1
17.4 Wax engravings	2.7
18. Use patent and wood base	3.3
19. Develop an understanding of the techniques of binding:	
19.1 Pamphlet	2.7
19.2 Book	2.6
20. Develop an understanding of ink	2.1
21. Develop an understanding of color in:	
21.1 Choose harmonious combinations	2.1
22. Practice the prevention of health and accident hazards in the composing rooms	3.

Layout Man — Typographer

1. Letter alphabets of:	
1.1 Renaissance	2.6
1.2 Gothic	3.3
1.3 Ancient Gothic	2.
1.4 More recent letters	3.4
1.5 Italics	3.4
1.6 German poster alphabets	2.5
1.7 American poster alphabets	3.3
1.8 Modern alphabets	3.4
1.9 Type faces:	3.6
1.91 Oldstyle types	3.6
1.92 Display types	3.9
1.93 Modern types	3.9
2. Use the best principles of design in:	
2.1 Purpose and function	3.7
2.2 Order	3.6
2.3 Movement	3.4
2.4 Radiation	2.8
2.5 Repetition	3.
2.6 Alternation	3.3
2.7 Graduation	3.3
2.8 Opposition	3.3
2.9 Contrast	3.5
2.10 Variety	3.7
2.11 Balance	3.7
2.12 Proportion	3.6
2.13 Growth	3.7
2.14 Harmony	3.7
2.15 Transition	3.2
2.16 Dominance and subordination	3.4
2.17 Unity	3.6
2.18 Rhythm	3.6
2.19 Appropriateness	3.9
3. Use color correctly in:	
3.1 Theories of color and color schemes	3.3
3.2 Pigment and ink mixture	2.3
3.3 Construction	2.5
3.4 Materials and skills in use	2.7
3.5 Mediums and skills in use	2.7
3.6 Surfaces and skills in use	2.7
4. Recommend and advise the selection of paper in:	
4.1 Kinds	3.6
4.2 Basic weights	3.2
4.3 Sizes	2.9
4.4 Figuring and cutting	3.
5. Attain good knowledge of the:	
5.1 Principles of art and design	3.9
5.2 Doing special requirements of design in various fields with special reference to graphic arts	3.2
5.3 Special limitations	3.1
5.4 Opportunities in expression	3.1
5.5 Opportunities in appreciation	3.3
5.6 Opportunities in practical use	3.4
5.7 Appreciation of values of design	3.6
5.8 Practical creative expression	3.4
5.9 Resourcefulness	3.3
5.10 Skills	3.3
6. Attain good knowledge of the elements of design:	
6.1 Line	3.3
6.2 Shape and form	3.6
6.3 Size and area	3.6
6.4 Proportion	3.6
6.5 Position	3.3
6.6 Direction	3.1
6.7 Interval and distance	3.4
6.8 Color	3.4
7. Attain good knowledge of type design	3.6
8. Make sketches and rough outs of and finished drawings of:	
8.1 Trade-marks	2.7
8.2 Book covers	3.3
8.3 Book jackets	3.
8.4 Book design	3.6
8.5 Title covers	3.6
8.6 Decorative initials	3.
8.7 Trade-marks	3.
8.8 Letterheads and stationery	3.7
8.9 Labels	3.2
8.10 Packages and containers	3.
8.11 Position advertising	3.2
8.111 Displays	3.3
8.112 Street-car cards	2.7
8.113 Posters	3.
8.114 Billboards	2.7
8.115 Signs	3.
8.116 Window cards	2.8
8.12 Direct advertising	3.7
8.121 Brochures	3.5
8.122 Broadsides	3.7
8.123 Folders	3.7
8.124 Booklets	3.7
8.125 Illustrated letters	3.3
8.126 Envelope stuffers	3.2
8.127 Calendars	3.3
8.128 Blotters	3.5
8.129 Catalogs	3.7
8.13 Space advertising	3.3
8.131 Newspapers	2.8
8.132 Periodicals	3.
8.14 Form printing (statements, etc.)	3.
8.15 Catalogs	3.2
8.16 Tabular forms and pages	2.7
9. Make drawings that fit into the limitations and advantages of:	
9.1 Hand composition	3.6
9.2 Machine composition	3.7
9.21 Linotype	3.6
9.22 Intertype	3.5
9.23 Monotype	3.8
9.24 Ludlow — APL	3.6
9.3 Zinc plate (line cut)	3.3
9.4 Zinc plate and tint block	3.1
9.5 Ben Day and other machine shading	3.
9.6 Block	2.9
9.61 Linoleum	2.7
9.62 Rubber	3.
9.63 Wood	3.9
9.7 Half tone and tint block	3.1
9.8 Two-color process	3.1
9.9 Three-color process	3.3
9.10 Four-color process	3.3
9.11 Lithography	2.7
9.12 Gravure	2.5
10. Attain general knowledge of presswork	3.3
10.1 Know the advantages and limitations of presses — what they can and cannot do — and make lay-outs accordingly	
11. Attain general knowledge of ink	2.9
11.1 Advise on the selection of suitable ink	2.7
11.2 Mix ink	2.7
11.3 Match ink	3.
12. Mark up for composition of all types of work	3.3
13. Do copyfitting accurately	3.6
14. Attain general knowledge of binding work	2.9
14.1 Regular pamphlet and book	2.9
14.2 Patent binding	3.
15. Prepare dummies	3.5
15.1 Brochures	3.

Linotype, Intertype, Linograph Operator

1. Compose commercial work on machines accurately and rapidly:	
1.1 Advertising work	2.9
1.2 Tariff work	2.2
1.3 Rules and tabular matter	3.
1.4 General run of commercial work (stationery, letterheads, etc.)	2.3
1.5 Office forms and tabular matter	2.5
1.6 Catalogs	3.4
1.7 Books	3.8
1.8 Textbooks	3.
2. Mark up copy for machines	2.7
3. Lay out all types of work	2.
4. Take proofs and correct	2.5
5. Practice use of good grammar and English	3.9
6. Divide words correctly	4.
7. Spell words correctly	3.9
8. Attain general knowledge of lockup and imposition	2.3
9. Attain a general knowledge of presswork	2.1
10. Attain a general knowledge of hand composition	2.7
10.1 Use composing-room tools	2.7
11. Attend to minor repairs on machine	3.8
11.1 Distributor stops	3.3
11.2 Magazine changes	3.3
11.3 Mold changes	3.4
11.4 Squirts	3.2
11.5 Measure changes	3.8
12. Do general machine maintenance work	3.
12.1 Cleaning	3.1
12.2 Adjustments	2.6
12.3 Replacements	2.3
12.4 Overhauling	1.8
13. Watch for occasional difficulties and get maintenance man	4.
13.1 Bad matrices	4.
13.2 Hairlines	4.
13.3 Faulty slugs	4.
14. Learn pi and extra sorts	3.6
15. Estimate space for type matter	3.2
16. Follow office style	3.7
17. Be ready to assist others	3.7
18. Join in group undertakings	3.
19. Help make things easier for others	3.7
20. Keep tools and materials in order	3.2
21. Plan tasks carefully and thoughtfully	3.9
22. Carry on tasks with least possible assistance	3.2
23. Be ready to assume responsibility	3.5
24. Work without loitering	4.
25. Lay out tabular matter to fit allotted spaces	
26. Place box heads in tables correctly	
27. Indent initials correctly	
28. Work on floor jobs	
29. Set type with clean proofs	
30. Distinguish fonts	

Duties	Weighted Importance
31. "M.ke" slugs and square matter	
32. Familiarize self with shop equipment and its location	
33. Match type	

Ludlow Operator

1. Set matrices and cast all types of display lines	4.
2. Take proper care of the machine to keep in a first-class operating condition	3.
3. Lay of ads	2.
4. Mark up for machine	3.
5. Assembly of ads	3.5
6. Operate the APL	4.
7. Attain knowledge of hand composition	4.
8. Cast heads	4.
9. Set display composition on all types of job composition	4.
10. Set rule forms	
10.1 Lay out	
10.2 Cast	
10.3 Assemble	

Monotype Caster

1. Operate composition caster (on straight matter) accurately and rapidly	3.8
2. Operate material maker accurately and rapidly on:	
2.1 One-point rules	3.
2.2 Two-point leads	3.6
2.3 Slugs	3.6
2.4 Borders	2.8
2.41 "Line" borders	2.6
2.42 "Design" borders	2.6
3. Operate giant caster accurately and rapidly	1.6
4. Operate keyboard accurately and rapidly	3.2
5. Set up machines quickly (changes for casting)	3.4
5.1 Composition caster (straight matter)	3.6
5.2 Sorts caster (6 point to 36 point)	3.2
5.3 Giant caster (36 point up)	
6. Attend to minor care of machines (adjustments)	3.2
7. Lay cases with type	3.
8. Care for molds	3.8
9. Clean and oil	3.

Machinist

1. Do general maintenance work on Linotype, Intertype, and Linograph	
1.1 Cleaning	3.5
1.2 Adjustments	3.7
1.3 Replacements	3.5
1.4 Overhauling	3.
1.5 Oiling and greasing	4.
2. Attend Teletypesetter keyboard unit and perforator	3.3
2.1 Attach, adjust, and keep in repair	
2.2 Perforator	
2.3 Keyboard	
3. Operate keyboard	2.5
4. Attain machinist training of general nature	3.2
5. Maintain a suitable supply of commonly used parts for repair purposes, and secure other parts when necessary	3.
6. Do maintain Ludlow in good operating condition	3.3
7. Do maintain APL in good operating condition	3.3
8. Do maintain Monotypes in good operating condition	3.3
9. Do maintain Elrod in good operating condition	4.
10. Maintain electric pots and controls in good condition	4.
11. Teach operators how to prevent common machine difficulties	

Monotype Keyboard Operator

1. Set up keyboard for job	3.4
1.1 Place ribbon	3.
1.2 Select key bars, key banks, stop bars, scale drum	3.2
2. Compose straight matter accurately and rapidly	3.8
2.1 Indent for initials and cuts	3.
2.2 Set matter around cuts — double justification	3.2
2.3 Set matter requiring inserts of another set	2.6
2.4 Letterspace	3.2
2.5 Set two-line figures	2.
2.6 Set typewriter and mailing list faces	1.8
2.7 Operate duplex keyboard	1.4
2.8 Set 14 and 18 point	2.
3. Compose tabular composition accurately and rapidly	3.8
3.1 Without vertical rules	3.2
3.2 With vertical rules	3.2
3.3 With ditto marks	3.2
3.4 With piece braces	3.
4. Care for keyboard	3.4
4.1 Cleaning	3.
4.2 Assembly	3.4
4.3 Adjustment	3.8
5. Mark up copy for setting	3.
6. Lay out all types of work	3.2
7. Take proofs and correct	2.2
8. Attain good working knowledge of grammar and English	3.4
9. Divide words correctly	3.4
10. Spell words correctly	3.4
11. Attain general knowledge of hand composition	3.2
12. Attain general knowledge of make-up	3.

Pamphlet Binder

1. Handle sheets of paper carefully to prevent soiling and waste:	
1.1 Before printing	3.2
1.2 After printing	3.3
1.3 In jogging	3.3
1.31 By hand	3.3
1.32 By machine	2.7
1.4 In counting	3.2
1.5 In cleaning	3.3
2. Fold accurately	4.
2.1 By hand	3.2
2.11 Fold to paper	3.2
2.12 Fold to register	3.5
2.13 Right angle	3.
2.14 Parallel	2.8
2.2 By machine on a:	
2.21 Dexter	2.8
2.22 Cleveland	2.8
2.23 Baum	2.2
2.24 Care for machine, adjust, oil, clean, etc.	2.2
3. Staple accurately	3.2
4. Stitch accurately	3.2
4.1 Saddle wire	3.3
4.2 Side wire	3.3
4.3 Automatic stitcher	3.4
4.4 Care for machine — adjust, oil, clean, etc.	
5. Place insets and extra sheets	3.4
6. Place guards	3.2
6.1 Guard signatures	3.2
6.2 Reinforce centers	3.2
7. Bundle	3.
7.1 Smash by hand	2.7
7.2 Operate smasher	2.2
7.3 Operate signature or bundling press	2.7
7.31 By hand	2.7
7.32 By machine	2.7
7.33 Care for machine	
8. Insert	3.2
9. Gather	3.2
9.1 By hand	3.2
9.2 By machine	3.
10. Collate	3.2
11. Bind with paste	3.2
12. Sew signatures	2.7
12.1 By hand	2.3
12.11 Saddle wire	3.5
12.12 Side wire	3.5
13. Cover	4.
13.1 Tip front and back	3.
13.2 Reinforce front and back	3.
13.3 Flush trim	3.7
13.4 Overhand or extension	3.
13.5 Split cover	2.2
13.6 Operate covering machines	3.2
14. Trim by:	
14.1 Hand cutter	3.
14.2 Power cutter	3.6
14.3 Automatic trimmer	2.2
15. Mix paste	3.2
16. Mix glue	3.5
17. Develop a good knowledge of paper	3.2
17.1 Kinds	3.2
17.2 Grain	3.2
17.3 Figuring for cutting	3.5
18. Develop a general knowledge of:	
18.1 Presswork	2.8
18.2 Cutting	3.4
18.3 Type composition	2.4
19. Operate efficiently and without lost motion	4.
19.1 Numbering machines	2.2
19.2 Paging machines	2.2
19.3 Perforator	3.4
19.4 Punching machine	3.4
19.5 Ruling machine	2.8
19.6 Drilling machine	2.8
20. Pad and tab accurately, neatly, and quickly	3.4

Platen Pressman

1. Operate C. & P. open rapidly	3.6
2. Operate Colt's Laureate rapidly	3.3
3. Operate platen automatic:	
3.1 Kluge	3.6
3.2 Miller	3.6
3.3 Rice	3.3
4. Properly make-ready the following:	
4.1 General run of work	3.9
4.2 Half tones	3.4
4.3 Vignettes	3.
4.4 Line-up and register	3.9
4.5 Jobs with overlays	4.
4.51 Hand cut	3.1
4.52 Mechanical	2.9
5. Operate folding machines	1.3
6. Overcome offset	
6.1 Heaters	3.7
7. Operate offset guns when necessary	3.3
8. Overcome work-ups	3.6
9. Overcome wrinkles	3.4
10. Overcome slurs	3.6
11. Repair battered plates	2.1
12. Use patent base and plate mounting equipment	2.4
13. Block out with borders	2.6
14. Print on cellophane	2.6
15. Emboss:	
15.1 Cold	2.9
15.2 Hot plate	2.7
16. Print gummed labels	3.1
17. Do embossed seal printing	2.3
18. Die-cut	2.7
19. Attain a good knowledge of ink:	
19.1 Correct selection of kinds of stock	3.1
19.2 Mix color and match color	3.4
19.3 Print with metallic inks	3.
20. Do facsimile letter printing	2.7
21. Do color printing:	
21.1 Two-color	3.6
21.2 Three-color	3.6
21.3 Four-color	3.1
22. Do bronzing	2.9
23. Do press feeding	3.6
24. Do thermography (raised letter printing)	1.9
25. Bind:	
25.1 Pamphlets	1.6
25.2 Books	1.6
26. Cut stock	
26.1 Understand grain of paper	2.3
26.2 Figure for cutting	1.9
27. Attain a general knowledge of composing machines on	1.3
27.1 Linotype, Intertype, Linograph	1.7
27.2 APL	1.7
27.3 Ludlow	1.7
27.4 Monotype	1.7
28. Lock up and impose all numbers of pages	2.2
29. Fill out timekeeping records	2.5
30. Attain working knowledge of printing plates:	3.5
30.1 Electrotypes	3.
30.2 Stereotypes	3.
30.3 Photoengravings	3.
30.4 Wax engravings	2.9
30.5 Rubber plates	2.7
31. Attain an understanding of the effect of change in humidity on paper stock	2.9
31.1 Air conditioning in pressrooms	2.7

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Duties	Weighted Importance
Printing Production Engineer	
1. Develop the following traits:	
1.1 Desire to know printing and its problems	3.8
1.2 An investigating mind	3.8
1.3 Study best ways of doing work economically	3.8
1.4 Work toward a plan of doing printing in the best way	3.8
1.5 Read trade journals	3.7
1.6 Read printing books	3.5
2. Instigate economics in printing plants	3.5
3. Eliminate waste in printing plants	4.
4. Standardize printing forms	3.
5. Simplify processes	3.8
6. Grasp viewpoint of:	
6.1 Clients and buyers of printing	3.7
6.2 Superintendents	3.
6.3 Foremen	3.
7. Analyze work of all departments	4.
8. Learn costs:	
8.1 Of other plants	3.2
8.2 Of own plants	3.5
8.3 Determine costs in own plant	3.2
9. Develop knowledge of a good mechanic	2.8
10. Practice work of a capable craftsman	3.2
11. Practice executive ability of a high order	3.8
12. Do double-entry bookkeeping	2.7
13. Estimate costs and direct the work of the estimator	3.5
14. Lay out and direct layout for intelligent production jobs of printing	3.
15. Plan printing	3.5
16. Plan layout of plants	3.5
16.1 Suggest equipment	3.7
16.2 Suggest arrangement	3.5
16.3 Know best installation methods	3.3
17. Attain a knowledge of letterpress printing in:	
17.1 Layout	3.3
17.2 Copyfitting	2.8
17.3 Editing	2.7
17.4 Mark-up	2.8
17.5 Paper specifications	3.7
17.6 Hand composition	3.3
17.7 Machine composition	3.3
17.71 Linotype, Intertype, Linograph	3.3
17.72 Monotype — all machines	3.3
17.73 APL	3.
17.74 Ludlow	3.2
17.75 Thompson	3.
17.8 Galley reading	2.7
17.9 Correcting	2.7
17.10 Revising	2.7
17.11 Preparing cuts	3.2
17.12 Assembly	3.3
17.13 Make-up	3.3
17.14 Proofing and reading	3.
17.15 Paste up	2.7
17.16 Presswork	3.7
17.17 Binding	3.5
18. Attain working knowledge in offset lithography:	
18.1 Platemaking	2.7
18.2 Presswork	3.
18.3 Where processes can be used to advantage	3.4
19. Attain knowledge of Gravure:	
19.1 Cylinder	2.4
19.2 Presswork	2.7
20. Attain working knowledge of:	
20.1 Electrotyping	3.2
20.2 Stereotyping	3.7
20.3 Offset	3.
20.4 Gravure	2.6
20.5 Silk-screen process	2.
21. Attain working knowledge of binding operations:	
21.1 Folding	3.7
21.2 Gathering	3.5
21.3 Binding	3.5
21.4 Cutting	3.5
Proofreader	
1. Collate (reading proof alone)	3.1
2. Mark proof accurately and speedily	3.8
3. Mark from copyreader's reading	3.
4. Mark proof to copyholder's reading	3.6
5. Work either side of two-man desk	2.3
6. Edit copy	3.1
7. Develop a good knowledge of printing processes	3.
8. Develop a good knowledge of English grammar	3.8
9. Develop a knowledge of foreign languages	1.9
10. Attain a familiarity with community life — names, positions, titles of important persons	2.6
11. File proof and copy	2.9
12. Send out copy and proofs to advertisers	2.9
13. Revise proofs	3.8
14. Revise (news) columns	1.8
15. Divide words correctly	3.4
16. Check poor copy, and correct it	3.2
17. Practice the office style	3.2
18. Recognize and understand type faces and sizes	
19. Develop an understanding of book make-up	
20. Develop an understanding of book imposition	
Stone Man	
1. Lock up all types of jobs for platens properly and speedily	3.9
2. Lock up all types of jobs for cylinders properly and speedily	4.
3. Impose properly and speedily:	
3.1 Two-page forms	3.9
3.2 Four-page forms	3.9
3.3 Six-page forms	3.6
3.4 Eight-page forms	3.9
3.5 Twelve-page forms	3.9
3.6 Sixteen-page forms	3.6
3.7 Twenty-four-page forms	3.6
3.8 Thirty-two-page forms	3.7
3.9 Sixty-four-page forms	3.5
4. Register forms	3.9
5. Break forms for color	3.4
6. Remedy	
6.1 Work-ups on presses	3.
6.2 Slurs on presses	2.2
7. Set plates on patent base to register	3.7
8. Lock up for electrotype foundry	3.5
9. Lock up for steel cutting dies	3.
10. Do pre-make-ready work	2.2
10.1 Make cuts type high	2.5
11. Attain the rating of a journeyman hand compositor	3.5
12. Attain a good working knowledge of:	
12.1 Presswork	3.1
12.2 Bindery	3.2
13. Line up and O.K. position of all sheets	4.
14. Impose and position for folding	4.

An Industrial-Arts Christmas Project

James Heath

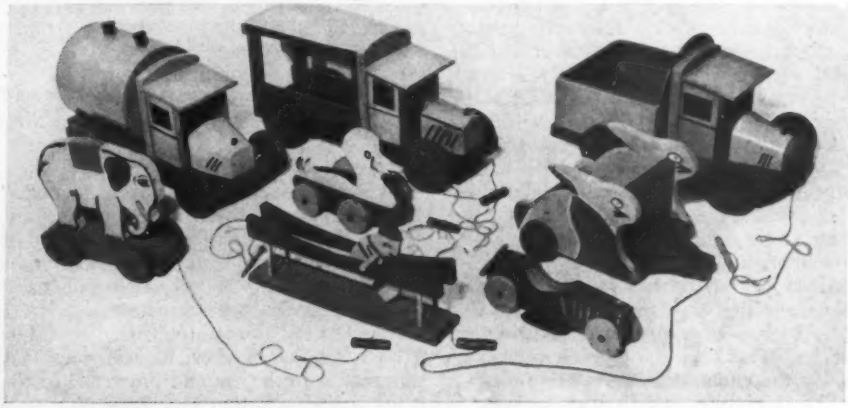
Alfred E. Burr School,
Hartford, Connecticut

A project which embodies more than mere shopwork — important as that is.

For the past fifteen years the industrial-arts department of the Alfred E. Burr School, Hartford, Conn., has carried out a program which has proved very successful, and which has now become a traditional practice for the two or three weeks preceding Christmas. During these years over two thousand sturdy, attractive toys have been made. They have been given as our contribution to the happiness of Hartford's poor children on Christmas morning.

When school opens in September a start is made collecting material. Empty gallon fruit cans from the school cafeteria are washed and sent to the shop. The sewing department contributes empty spools. The school custodian saves empty packing cases, old cabinets, and odd pieces of sheet metal. Old leather gloves make excellent wiggle ears for elephants and other animal toys. The instructor designs toys in the construction of which this material can be utilized. Models are made and attractive color schemes selected. Patterns of the various pieces are cut, and jigs are made which will help to speed up the work.

Work on the toys is begun when school opens after the Thanksgiving recess. It



Samples from the Alfred E. Burr School, branch of Santa Claus workshop

should be added that the work is voluntary. Pupils are allowed to continue their regular projects if they wish to do so, but it is found that most of the boys enjoy the special Christmas program and are willing to help.

This is a *grand* opportunity to demonstrate the production system used in manufacturing plants. The boys usually work in pairs completing one operation or part of a toy. During the painting operation boys with a special aptitude find an opportunity to demonstrate their skill painting lines on various parts. This painting is all done before assembling. The assembling of the various parts to form a complete toy is a delightful occupation for the boys. They love to see the bundles of parts transformed into rows of elephants, ducks, tank trucks, express trains, tumbling men, and other toys. All the children love to play with the toys each of which is equipped with wheels or moving parts to make it the more attractive, and a string or handle wherewith to pull it.

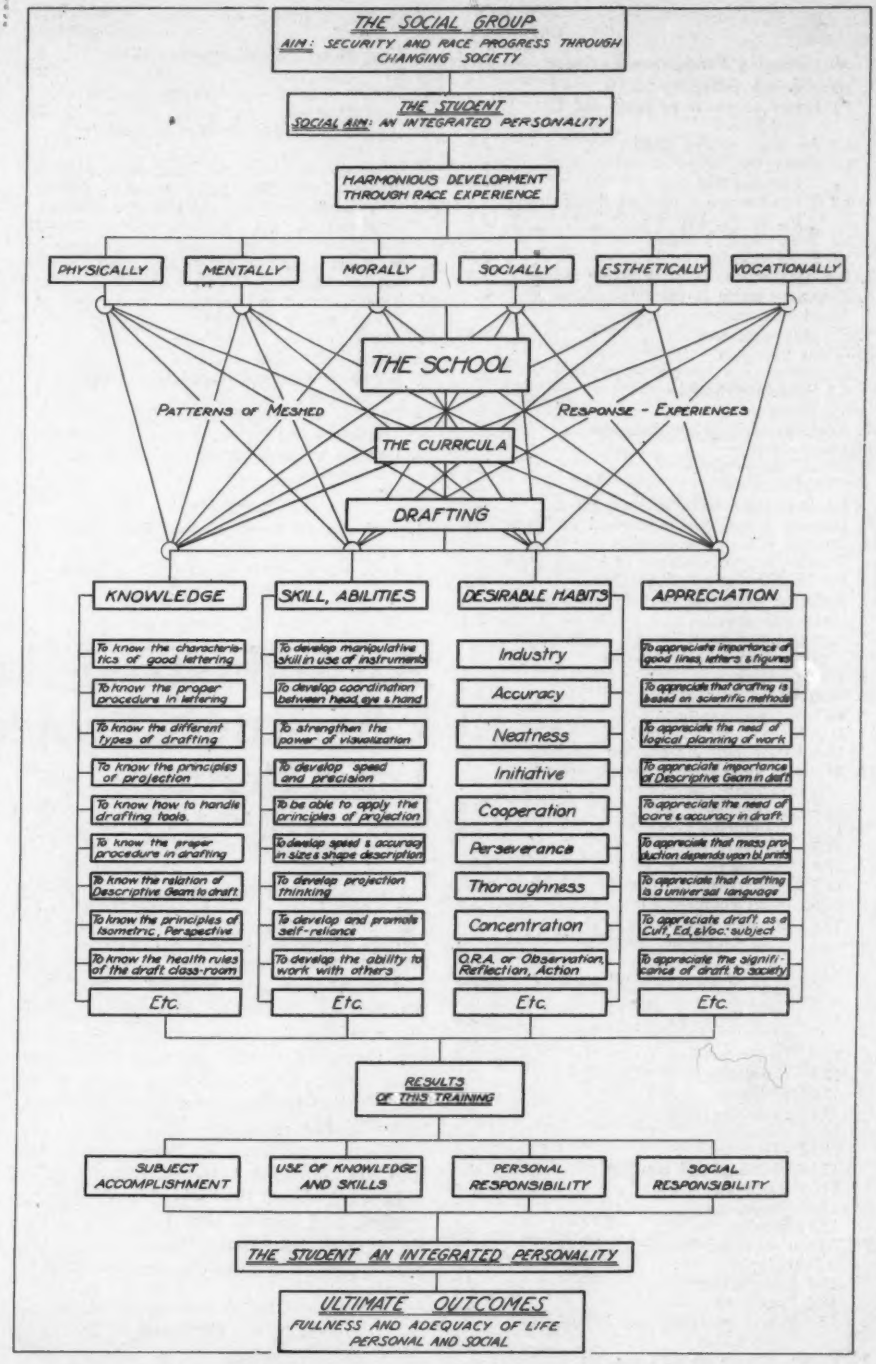
There is something much more significant than the acquisition of practical knowledge acquired by such a program. During the three weeks this work is carried on the children are gradually acquiring the real Christmas spirit of helping and giving. Christmas is the time we celebrate God's gift to mankind, so these toys are to be given to children who, because of unfortunate conditions, would otherwise find that Santa Claus had left no toy on Christmas morning.

The complete Christmas assembly program is arranged by the industrial-arts instructor, at which time the toys are presented to a local social-service agency for distribution. As many boys as possible take part in the Christmas program. An exhibit of the toys is arranged on the stage, with a background of colored lights. Usually the art department is called on to make a colorful sign about ten feet long, with a motto such as *Do your part and be happy*. This is hung on the back wall of the stage with a large, white electric star above it. This star, which measures about 24 in. across the points, is incidentally made by the boys in the shop. Christmas music is played by the school orchestra and Christmas carols are sung by the school glee club. One of the boys who has prepared a short, but appropriate speech presents the toys to some person representing the social agency which is to distribute them. The shop instructor is usually called on by the school principal to give a short talk.

A report of the assembly program is written up by a member of the school-paper staff, and is sent in as well to the local newspapers. Not only do the latter carry an account of this event, but also send photographers to cover the exhibit.

All in all, this project requires considerable organizing to insure that it is carried through to a successful conclusion in time for the Christmas assembly, but the results justify the effort.

The chief values of the project may be summarized as follows:


THE SOCIAL GROUP
AIM: SECURITY AND RACE PROGRESS THROUGH CHANGING SOCIETY
THE STUDENT
SOCIAL AIM: AN INTEGRATED PERSONALITY
HARMONIOUS DEVELOPMENT THROUGH RACE EXPERIENCE
PHYSICALLY
MENTALLY
MORALLY
SOCIALLY
ESTHETICALLY
VOCATIONALLY
THE SCHOOL
PATTERNS OF MESHED
RESPONSE - EXPERIENCES
THE CURRICULA
DRAFTING
KNOWLEDGE
SKILL, ABILITIES
DESIRABLE HABITS
APPRECIATION
To know the characteristics of good lettering
To know the proper procedure in lettering
To know the different types of drafting
To know the principles of projection
To know how to handle drafting tools
To know the proper procedure in drafting
To know the relation of Descriptive Geom to draft
To know the principles of Isometric, Perspective
To know the health rules of the draft class-room
Etc.
To develop manipulative skill in use of instruments
To develop coordination between head, eye & hand
To strengthen the power of visualization
To develop speed and precision
To be able to apply the principles of projection
To develop speed & accuracy in size & shape description
To develop projection thinking
To develop and promote self-reliance
To develop the ability to work with others
Etc.
Industry
Accuracy
Neatness
Initiative
Cooperation
Perseverance
Thoroughness
Concentration
O.R.A. or Observation, Reflection, Action
Etc.
To appreciate importance of good lines, letters & figures
To appreciate that drafting is based on scientific methods
To appreciate the need of logical planning of work
To appreciate importance of Descriptive Geom in draft
To appreciate the need of care & accuracy in draft
To appreciate that mass production depends upon bl prints
To appreciate that drafting is a universal language
To appreciate draft as a Cult, Ed, &Voc. subject
To appreciate the significance of draft to society
Etc.
RESULTS OF THIS TRAINING
SUBJECT ACCOMPLISHMENT
USE OF KNOWLEDGE AND SKILLS
PERSONAL RESPONSIBILITY
SOCIAL RESPONSIBILITY
THE STUDENT AN INTEGRATED PERSONALITY
ULTIMATE OUTCOMES
FULLNESS AND ADEQUACY OF LIFE PERSONAL AND SOCIAL

Graphical Presentation of What Drafting Contributes to the Education of the Individual. By A. K. Rigast, Sacramento Senior High School, Sacramento, California

It is a cooperative effort involving the participation of a large number of school departments. Each makes its own special contribution, the combined effort resulting in a wholly worth-while and socially significant achievement.

Considering the values from the industrial-arts point of view, it is obvious that the pupils are happy and interested in the work and in addition they have an opportunity to study at firsthand the production methods used in industrial plants.

More important, the spirit of cooperation, giving and helping others, is taught in a practical way, with the shop becoming the center of this activity in school and the instructor co-ordinating the work of various contributing departments, as well as the numerous details of actual construction.

When the instructor contacts the social-service agency which distributes the toys,

he usually meets some of his city's influential people. This gives him an excellent opportunity to gain their good will and cooperation.

The boys and girls are "thrilled" making the toys, thoroughly appreciate the colorful and enjoyable assembly program, and carry home their enthusiasm for industrial-arts work.

A commendatory write-up, assisted by one or two pictures, in the local papers is, incidentally, a most helpful way of reminding the public and the taxpayers that their industrial-arts department is functioning in a worth-while manner.

A Follow-Up Study of Trade-Industrial Arts as an Educational Panacea

Eliot Birnbaum

Rouses Point, New York

The statement has often been made that industrial-arts courses should be the integrating factor or the "center" of our school curriculums. So sweeping a claim requires a substantial basis of facts. It is the purpose of this article to inquire into the validity of this assumption.

The word *integration* has become a popular catchword in modern educational phraseology. We are told that all subjects in the curriculum must be integrated because all knowledges are ultimately related; and that subject-matter barriers are arbitrary and artificial. It is pointed out that industrial arts are related to science, mathematics, art, economics, sociology, and so through a cross section of our culture. These statements when linked to the psychological truth that activity is the basis of learning, leads to the conclusion that the industrial arts should be the integrating factor in the school curriculum.

Do the above statements hold all the evidence necessary to the establishment of the validity of this claim? Shall educators, who speak so enthusiastically of scientific approaches, revert to the deductive methods of logic for their conclusions? Upon a basis of statements similar to those postulated for industrial arts, one could justify military training as the center of the school curriculum. It is an activity program; it is related to science, mathematics, economics, sociology, certainly to history, and to art — as the heroic statues of generals bear witness. On similar assumptions, there is hardly a subject which cannot lay claim to the right of pre-eminence in the integration of the curriculum.

The integration of a curriculum must be placed beyond the influence of any subject. Life, with its complex demands, must be the focus of our educational efforts, not adult life, not the ideal life, but the type of life in which our pupils are daily participating. How well we can aid our children in meeting their daily problems is determined not by subjects, but by the emphasis, the orientation, given to our subjects. It is well enough to speak of the ideal life and to strive for it: but the exigencies of daily living are much more potent determiners of behavior than ill-defined ideals. Nor is the school, as some would have us believe, the most potent factor in shaping our ways of living.

Various subjects may contribute in varying ways to helping our children meet their daily problems and possible future needs. It is not the subject, or its content, which determine how well these needs are met. It is the orientation of the subject matter which determines its educational effectiveness. It is not knowledge that is man's greatest need, but knowledge for specific purposes. Purposes vary with the individual, with the neighborhood, with the community. Industrial arts can help meet some of these needs if it is a plastic, functional type of education.

Industrial arts is not an educational panacea. It is one of the many fields of activity and knowledge that constitute our culture. Because it is closely related to other fields of activity; artistic, scientific, and the like, it has the potentialities of making the relationships between these fields more understandable to our children. However, we must not attempt to cover all fields of knowledge because of some ultimate relationship. True integration means the breaking down of subject-matter barriers so that any activity or knowledge is allowable in any subject so long as it is *pertinently* related to the problems being pursued, is educationally important, and is of such a nature that the children can profit from it. We must remember that industrial arts is a specific type of orientation of knowledge — not a sequence of arbitrarily chosen skills and knowledges. Glassworking in a chemistry class is no more industrial arts than electroplating in the industrial-arts shop is chemistry. Artificial or forced integration leads not to knowledge, but to confusion.

There is no magic in integration that will inevitably lead to integrated individuals: for the ability to grasp the relationships and significance of facts that are apparently not closely related is not a result of schooling but a function of intelligence, and intelligence is God-given, not man-made. An integrated curriculum can no doubt lead to a more informed student with some understanding of the unity of things. It is not merely integration, but the manner of integration which determines the effectiveness of formal education.

To return to the question of whether industrial arts be the center of integration, we might ask if there is evidence that industrial-arts teachers as a group have a better understanding of our culture and our children than other teacher groups. Is industrial-arts education, because it is an activity subject, necessarily progressive? Let us forget how educationally important we are. Perhaps, a bit of modesty may lead to a bit of reflection. When we accuse others of being bound by tradition, let us be sure that we are free. When we brand other subjects as arbitrary, let us make certain that industrial arts is not allowing *rigor mortis* to set in. When we speak of meeting the life needs of children, let us be sure that we are not thinking of our own life needs. Then, perhaps, by sheer merit, industrial arts may become the center of the curriculum.

QUALIFICATIONS OF A FOREMAN

A foreman is one who, by reason of ability, has stepped out in front of his gang, and has stamped himself with that "something" which has convinced his superiors that he possesses the qualifications of a foreman. What are those qualifications?

A man does not become a foreman simply because he is a better mechanic, because he is better on detail, because of the excellence of his handiwork; not these alone, but also because he is capable of leadership, because he has vision and is able to see all that is going on around him and properly evaluate it. He sees not only his men, but envisions what they will do under certain circumstances, and he arranges those circumstances so that the best results will follow. That is why he is called a *supervisor* — because he has *super-vision.*

The foreman is, of course, a thinker, for progress is dependent upon how leaders think. Not only is he a thinker but he inspires his men to think, and if he is the right kind of foreman, he leads them to think the right thoughts. Right thoughts produce right work, and right work is safe work. When a foreman thinks out his job first and then carries it out according to plan, he is using super-vision. Super-vision preconceives efficiency and safety. Be a supervisor in fact as well as in name.— *Good Gulf Foreman, February, 1939, News Letter, Power-Press Section, National Safety Council, Inc.*

Lessons for Young Workers — XV

Thomas Diamond

Vocational Education Department,
University of Michigan,
Ann Arbor, Michigan

The final article of this series of suggestive lessons designed to help students of industrial arts and vocational education.

The Human Note in Industry

An understanding between employer and employee is essential if a business is to make good today — or tomorrow. Such an understanding must be general throughout the industrial world if the country and the industries of the country are to attain the prosperity which is within their grasp. The partnership between labor and capital cannot produce the results desired while the two partners are wrangling with each other. They must get together, and keep together, if they want to reap the industrial harvest of high wages and good profits. Consequently any and every means of bringing about such an understanding needs to be explored, and, what is still more important, tested in practice.

Yesterday and Today

In the old days of small enterprise the two partners were in close touch. Master and man knew each other, and the intimate personal relationship which existed provided the basis for mutual understanding. In these days of great ventures the employer and employee are very much farther apart. Particularly is this the case in industrial enterprises carried on by limited liability companies. Here the employer's work is delegated. Often, though by no means invariably, that essential part of an employer's duty, care for the welfare of those in his employ, is considered to be no part of the managerial function. The worker becomes a mere cog in the machine. But if you treat a man as a cog in a machine, trouble is to be expected. The human cog has initiative. He can, if he wishes, upset the working of the whole machine.

Welfare Work

Today the captain of industry who desires a contented crew takes steps to introduce the human note into factory and workshop. He recognizes that healthy conditions in the factory are as necessary for good output as they are desirable for the worker. He realizes that the provision of any means that can be taken to add to the workers' contentment is a sound business proposition. He strives, therefore, to make the undertaking he controls self-centered, a place where the average man's needs both for play and work shall be provided for. He cannot do this himself if he has thousands of men under his direction, but he arranged for a capable representative to deal solely with these thousand and one human needs, which are just as important to the worker as his wages. And what the big employer finds expedient should commend itself equally to the good sense of the small employer. One point needs to be remembered in the inauguration of any welfare work. There must be no suggestion that it is philanthropic. The workers pay for it in output through increased efficiency.

The Atmosphere of Content

Welfare work is, however, only a means which may help to bring about a better understanding between employer and his employees. What it does really is to create an atmosphere in which good will may grow. The employee who finds that special steps are taken to secure his creature comforts, to make life pleasant outside working hours as well as in the factory, feels that he is something more than a mere producer of profits. The interests that center about his work bring home to him the fact that he is recognized as something worth more consideration than a piece of mechanism which can be replaced at any moment. That recognition is the first step toward making him feel that he is part of "the firm," and that the firm's interests are his interests. Moreover, it fosters in no small degree that team spirit which is as valuable in industry as it is in the playing field.

Personal Touch

Making for unity and fostering cooperation, care for the well-being of the employees is of prime importance to industrial progress. The principle can be carried farther. There is no real reason why similar attention should not be extended to matters affecting work and wages. If employers were in actual personal touch with their employees half the causes of strife and discontent would be swept away. Often there are too many intermediaries. The employer does not know of the number of little grievances that mean so much to the man who has to put up with them day by day. Complaints are not encouraged, whereas sympathetic consideration and a few words of explanation would dispel many a gathering storm. Direct personal contact would be impossible between the heads of big undertakings and every one of their employees, but it is possible in smaller enterprises, and the same result might be attained in the larger ones by regular meetings between representative committees of the workers and the heads. Any means making for industrial peace is worth trying, for industrial peace is essential to industrial prosperity. — *From the Manchester Guardian.*

Testing and Tests

TRUE AND FALSE QUESTIONS

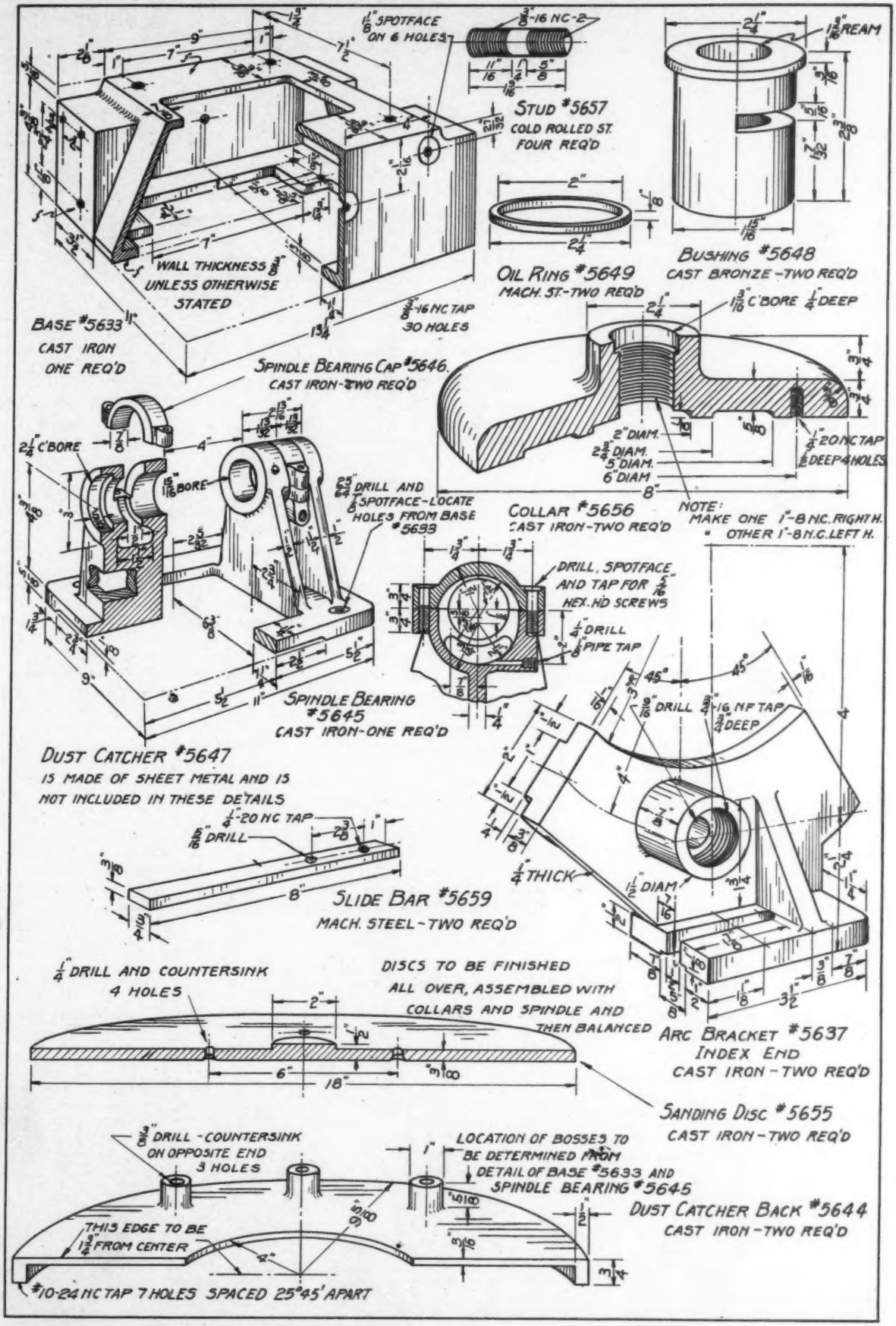
Fred W. Weyer, Los Angeles, California
Section 2

Questions Based on Hjorth's *Principles of Woodworking*

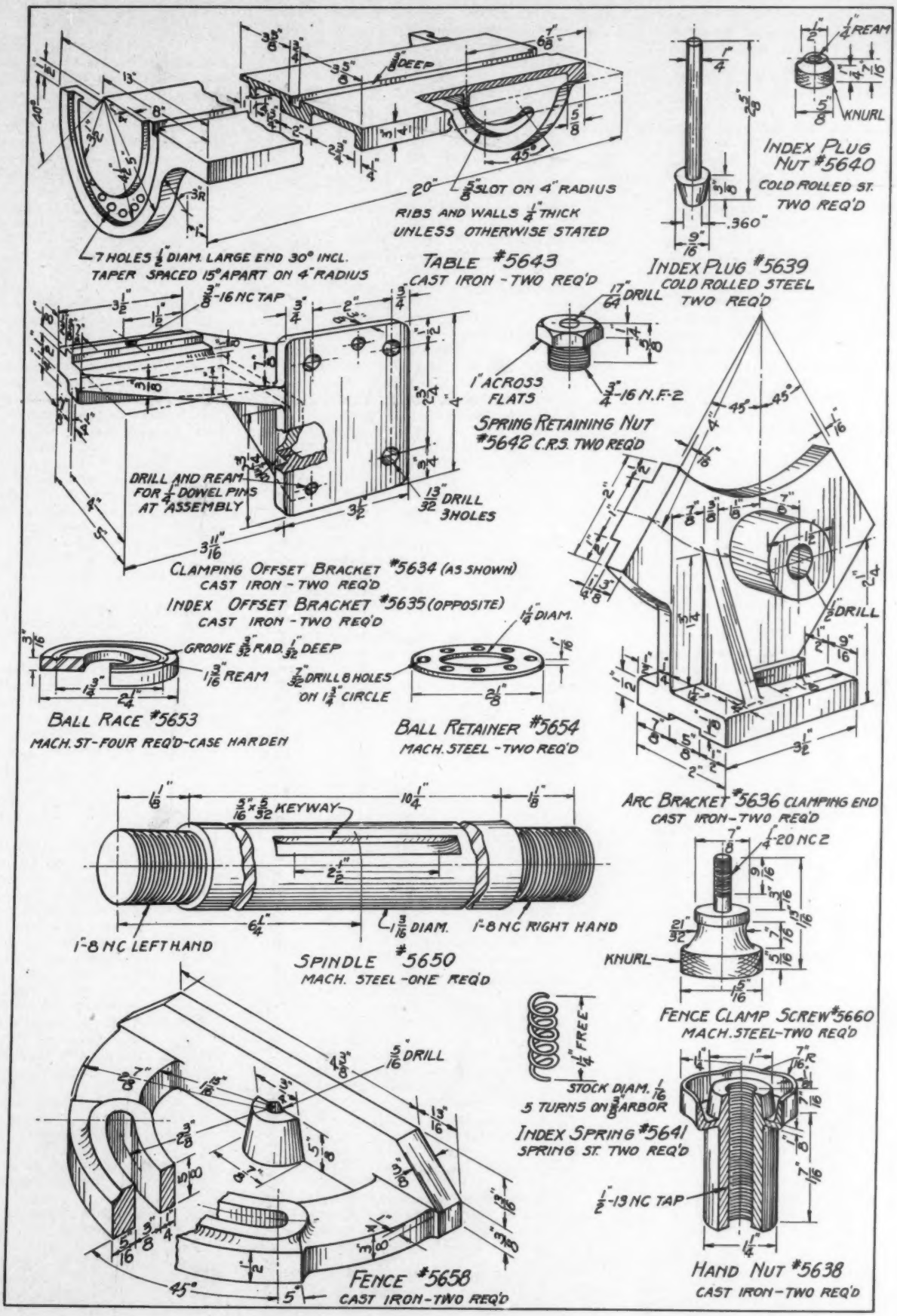
The true and false questions listed below will be answered by placing the letter *T* to indicate *true* or the letter *F* to indicate *false* at the right-hand side of the sheet in the space provided for same:

1. A dowel joint is made as a substitute for mortise-and-tenon joint. ....
2. Dowels are made of softwood. ....
3. Dowels should be ⅛ in. shorter than the combined length of the holes. ....
4. A doweling jig insures straight and accurate hand boring. ....
5. Half-lap joints are made by cutting half the thickness of the material away from each piece. ....
6. The thickness of a tenon should be 2/3 the thickness of the material. ....
7. A stub mortise-and-tenon joint is used where great strength is not required. ....
8. The table-haunched joint has a beveled haunch. ....
9. A through mortise-and-tenon joint is made on the ends of 2 pieces, the mortise is cut with a saw. ....
10. When the members of a mortise-and-tenon joint are to come flush, they are gauged from one face. ....
11. The terms *shoulder* and *cheek* refer to the mortise. ....
12. Either the chisel or a combination of boring out and chiseling is used to cut a mortise by hand. ....
13. Cheek cuts for a tenon are made on the circular, rip, or miter saw. ....
14. Pinned mortise-and-tenon joints are used to insure the holding of a joint if the glue fails. ....
15. Through, multiple, dovetail joints are used on drawer fronts. ....
16. Solid drawer bottoms should run

(Continued on page 25)


BASE #5633
CAST IRON
ONE REQ'D
WALL THICKNESS 3/8" UNLESS OTHERWISE STATED
1" SPOTFACE ON 6 HOLES
3/8"-16 NC TAP 30 HOLES
STUD #5657
COLD ROLLED ST.
FOUR REQ'D
OIL RING #5649
MACH. ST.-TWO REQ'D
BUSHING #5648
CAST BRONZE-TWO REQ'D
REAM
SPINDLE BEARING CAP #5646
CAST IRON-TWO REQ'D
1 3/16" C'BORE 1/4" DEEP
2" DIAM.
2 3/4" DIAM.
5" DIAM.
6" DIAM
1/4"-20 NC TAP 1/2" DEEP 4 HOLES
NOTE: MAKE ONE 1"-8 NC. RIGHT H. OTHER 1"-8 N.C. LEFT H.
2 1/4" C'BORE
1 15/16" BORE
25/64" DRILL AND 1/8" SPOTFACE-LOCATE HOLES FROM BASE #5633
SPINDLE BEARING #5645
CAST IRON-ONE REQ'D
COLLAR #5656
CAST IRON-TWO REQ'D
DRILL, SPOTFACE AND TAP FOR 5/16" HEX. HD SCREWS
1/4" DRILL
1/8" PIPE TAP
DUST CATCHER #5647
IS MADE OF SHEET METAL AND IS NOT INCLUDED IN THESE DETAILS
1/4"-20 NC TAP
5/16" DRILL
SLIDE BAR #5659
MACH. STEEL-TWO REQ'D
45°
9/16" DRILL 3/4"-16 NF TAP 3/4" DEEP
1/4" THICK
1 1/2" DIAM
ARC BRACKET #5637
INDEX END
CAST IRON-TWO REQ'D
1/4" DRILL AND COUNTERSINK 4 HOLES
DISCS TO BE FINISHED ALL OVER, ASSEMBLED WITH COLLARS AND SPINDLE AND THEN BALANCED
SANDING DISC #5655
CAST IRON-TWO REQ'D
3/16" DRILL-COUNTERSINK ON OPPOSITE END 3 HOLES
LOCATION OF BOSSES TO BE DETERMINED FROM DETAIL OF BASE #5633 AND SPINDLE BEARING #5645
THIS EDGE TO BE 1 3/4" FROM CENTER
DUST CATCHER BACK #5644
CAST IRON-TWO REQ'D
#10-24 NC TAP 7 HOLES SPACED 25°45' APART

18-in. Twin Disk Sander. Detail sheet No. 2, by W. A. DeVette
(For article, assembly and detail sheet 1, see December, 1939, Industrial Arts and Vocational Education)


7 HOLES 1/2" DIAM. LARGE END 30° INCL. TAPER SPACED 15° APART ON 4" RADIUS
5/8" SLOT ON 4" RADIUS
RIBS AND WALLS 1/4" THICK UNLESS OTHERWISE STATED
TABLE #5643
CAST IRON - TWO REQ'D
INDEX PLUG NUT #5640
COLD ROLLED ST. TWO REQ'D
KNURL
INDEX PLUG #5639
COLD ROLLED STEEL TWO REQ'D
.360"
17/64" DRILL
1" ACROSS FLATS
3/4"-16 N.F.-2
SPRING RETAINING NUT #5642 C.R.S. TWO REQ'D
3/8"-16 NC TAP
DRILL AND REAM FOR 1/4" DOWEL PINS AT ASSEMBLY
13/32" DRILL 3 HOLES
CLAMPING OFFSET BRACKET #5634 (AS SHOWN)
CAST IRON - TWO REQ'D
INDEX OFFSET BRACKET #5635 (OPPOSITE)
CAST IRON - TWO REQ'D
GROOVE 3/32 RAD. 1/32 DEEP
1 3/16" REAM
7/32" DRILL 8 HOLES ON 1 3/4" CIRCLE
1 1/4" DIAM.
BALL RACE #5653
MACH. ST - FOUR REQ'D - CASE HARDEN
BALL RETAINER #5654
MACH. STEEL - TWO REQ'D
ARC BRACKET #5636 CLAMPING END
CAST IRON - TWO REQ'D
5/16" x 5/32" KEYWAY
1"-8 NC LEFT HAND
1"-8 NC RIGHT HAND
1 3/16" DIAM.
SPINDLE #5650
MACH. STEEL - ONE REQ'D
1/4"-20 NC 2
KNURL
FENCE CLAMP SCREW #5660
MACH. STEEL - TWO REQ'D
5/16" DRILL
FENCE #5658
CAST IRON - TWO REQ'D
1 1/4" FREE
STOCK DIAM. 1/16
5 TURNS ON 3/8" ARBOR
INDEX SPRING #5641
SPRING ST. TWO REQ'D
1/2"-13 NC TAP
HAND NUT #5638
CAST IRON - TWO REQ'D

18-in. Twin Disk Sander. Detail sheet No. 3, by W. A. DeVette

(Continued from page 20)

from side to side. ....
17. The object of panel construction is to provide for shrinkage and to prevent warping in the surface. ....
18. A panel is always glued in the grooves of a frame. ....
19. A spline miter joint is used in mitered picture frames. ....
20. The hinges for a rule joint should have one leaf longer than the other. ....
21. A finger joint is used on a fly rail as a mechanical-action joint. ....
22. Thin strips to be edge planed should be placed between two boards. ....
23. Very little skill and accuracy is required in gluing and clamping. ....
24. Casein glue is a water-resistant glue. ....
25. Animal glue is usually sold in powdered form. ....
26. Water-soaked animal glue swells to several times its original size. ....
27. Hot glue should have a thin consistency. ....
28. The openings of clamps should be adjusted in preparation for gluing. ....
29. Before gluing, the pieces should be clamped up to see that they fit. ....
30. Hot glue should be brought to the boiling point before using. ....
31. A glue scraper is used before gluing. ....
32. Two boards to be glued up should be tested by tightening a clamp at each end. ....
33. After glue is applied to two boards, the center clamp on top should be tightened first. ....
34. Glued boards are brought to the same level after clamping by use of a mallet. ....
35. Bulging of glued boards is corrected by releasing the tension on the clamp. ....
36. Wide tops are made true, while gluing, with hand screws and cross strips. ....
37. Bar clamps are laid flat on their sides on the glue bench in preparation for gluing. ....
38. Joints of a frame are numbered after fitting in the order in which they are to fit together. ....
39. If several sides and all joints of a cabinet are glued up in one operation, the result may be an unsatisfactory job. ....
40. The horizontal position of clamps are changed to the oblique to correct for squareness. ....
41. Hot water and a rag are used to clean off surplus glue from the wood. ....
42. Glued up ends of cabinets are scraped and sandpapered after the final assembly of the complete cabinet. ....
43. Clamping up without glue is a necessary operation in assembly for testing. ....
44. Measuring the diagonals of a case is a good method of testing for squareness. ....
45. Sash cord or rope can be used in the place of clamps when gluing up circular or curved work. ....
46. Four legs to be glued to a turned column are all glued on at the same time. ....
47. Holes bored for wood screws in hardwood should be smaller than the threaded part. ....
48. The sides of a screw-driver bit should be flat and square and should fit the slot. ....
49. Hinges are placed on a door so that they are just opposite to the top and bottom rails. ....
50. Hinges on a box or chest should be placed the length of the hinge from the end. ....
51. Loose pin butts are separated in two parts when being applied to the door and frame. ....
52. Setting hinges is one of the most particular and difficult jobs of hardware application. ....
53. Caster rings and sockets prevent the wood from splitting. ....
54. Wood turning is a comparatively new trade. ....
55. The scraping method of wood turning is the easiest for the beginner to use. ....
56. A lathe with a 12-in. swing will turn a cylinder 12 in. in diameter. ....
57. The headstock of a lathe has adjustable position and can be moved to different points on the bed. ....
58. The lathe should run at 2500 r.p.m. when the belt is on the smallest step on the cone pulley. ....
59. Stock up to 3 in. in diameter can be turned at the highest speed of the lathe. ....
60. The material is driven onto the live center in the headstock, with a mallet. ....
61. Saw cuts are made in hard material to allow the spur center to enter more easily. ....
62. Oil is used on the wood at the live center to prevent heating by friction. ....
63. The toolrest is placed about ⅛ in. away from the work at the largest part. ....
64. The round-nosed chisel is used to make concave cuts when turning by the scraping method. ....
65. Spindle and disk sanding can be done on the lathe. ....
66. The disk sander is used to sand the flat faces of boards. ....
67. The purpose of *chucking* on the lathe is to permit the centering of a piece that has already been turned on one face. ....
68. Both inside and outside chucks are turned on the lathe to hold the work. ....
69. Split turnings are sawn on the circular saw after turning. ....
70. Surface decoration should be simple and appropriate. ....
71. Kitchen furniture and that made of soft or inexpensive woods are painted for decoration. ....
72. Veneers are often surrounded by an inlaid border. ....
73. Insets are used in the center of matched crotch and burl veneers. ....
74. Spiral reeding and straight reeding are used on different parts of long columns. ....
75. Two-tone work should show a heavy contrast. ....
76. An inlay tool for lines and bands can be made from a marking gauge and hack-saw blade. ....
77. A router plane is often used on inlay work.
78. An inlaid piece can be scraped after setting about ten hours to dry. ....
79. Insets are glued with the paper side down. ....
80. The electric router in connection with the lathe can be used to cut reeding and fluting. ....
81. The cutting of spiral reeds by hand is less difficult than cutting straight reeds. ....
82. Single and double spirals can be cut on a turned piece either by hand or on a special lathe. ....
83. The easiest way for the beginner to learn wood carving is to try some of the simpler forms with the tools. ....
84. Beads are cut with a scratch stock — a homemade tool. ....
85. Stop chamfers are cut full length with a plane. ....
86. Strapwork is a form of wood carving. ....
87. An *ogee* molding is made up of a bead and a cove. ....
88. A sunk fillet can be made by sawkerfing on straight work. ....
89. All moldings that are made on the shaper can be made by hand. ....
90. Matched veneers should be taken from the same log in order as they are sawn. ....
91. Glue is applied to the veneer as well as the core when gluing up. ....
92. If veneer cauls are heated, the zinc plates can be omitted. ....
93. Veneer is glued t a curved surface with curved auls to match the surface. ....
94. Matched veneers are prepared for gluing by connecting the members with paper tape. ....
95. Pressure, when gluing veneered work, should be applied to the ends first. ....
96. Veneer pins are used to keep the veneer in its place when cutting and gluing. ....
97. Veneer blisters are places that are not glued and must be slit open and glued. ....
98. An angle mirror can be used to predetermine the results of matching veneers. ....
99. Frets are pierced overlays when applied to veneering. ....
100. Grills are frets or lattice work set in an open frame. ....

Key

1. T. 2. F. 3. T. 4. T. 5. T. 6. F.
7. T. 8. T. 9. F. 10. T. 11. F. 12. T.
13. T. 14. T. 15. F. 16. T. 17. T. 18. F.
19. F. 20. T. 21. T. 22. T. 23. F. 24. T.
25. F. 26. T. 27. T. 28. T. 29. T. 30. F.
31. F. 32. F. 33. T. 34. T. 35. F. 36. T.
37. F. 38. T. 39. T. 40. T. 41. T. 42. F.
43. T. 44. T. 45. T. 46. F. 47. T. 48. T.
49. F. 50. T. 51. T. 52. T. 53. T. 54. F.
55. T. 56. T. 57. F. 58. T. 59. T. 60. F.
61. T. 62. F. 63. T. 64. T. 65. T. 66. F.
67. T. 68. T. 69. F. 70. T. 71. T. 72. T.
73. F. 74. T. 75. F. 76. T. 77. T. 78. T.
79. F. 80. T. 81. T. 82. T. 83. T. 84. T.
85. F. 86. T. 87. F. 88. T. 89. T. 90. T.
91. F. 92. T. 93. T. 94. T. 95. F. 96. T.
97. T. 98. T. 99. T. 100. T.

Problems and Projects

VISUAL TEACHING AIDS

M. F. Foss, Washington, Pennsylvania

Teachers of mechanical drawing recognize certain problems which never fail to present themselves. A solution involving the use of visual teaching aids is often more effective than a lengthy explanation. Three problems are presented with the teaching aids used to solve them.

The first problem is common with advanced drawing students; how do you find the line of intersection between two solids? The student is furnished with modeling clay from the art department or toy counter of the local dime store. The student molds the solids in question. He reads that the line of intersection is found by passing successive planes through these two solids. He uses a fine steel wire to cut them. In this way he sees for himself how the solids are cut by the planes, and in most cases goes ahead without further help. See Figure 1.

Fig. 1. Finding the line of intersection with modeling clay

The second teaching aid is an adaptation of an established procedure. Small wooden models have long been in use for use by the individual student. The large classroom models illustrated in Figure 2 are used for blackboard demonstration. They have the advantage of being easily handled and seen by all students.

The use of one-fourth plywood for all parts except the handle makes the model light and easy to handle. It is suggested that each part be painted a contrasting color and the handle painted black. The various colored surfaces

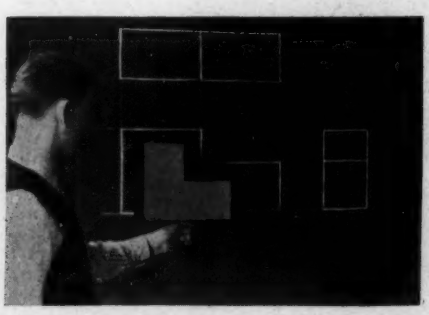


Fig. 2. Demonstration models

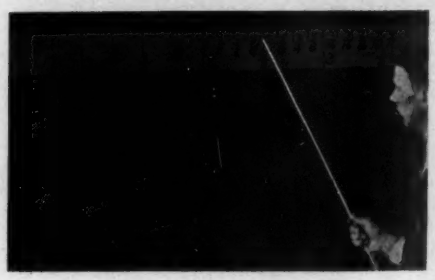


Fig. 3. Blackboard scale

help the beginning student to see all views and the handles permit the teacher to hold the models in demonstration without touching the surfaces.

The third teaching device is a large blackboard scale. See Figure 3. Many students entering the drawing room for the first time are deficient in scale-reading ability. In order to determine those pupils needing further instruction a pretest is recommended.

Morrison says in his book *The Practice of Teaching in the Secondary School:* "The needs of the pretest are satisfied when the teacher has become aware of the pupil's present experience and knowledge in the unit which the latter is about to attack." The pretest is given on the regular scale, Figure 2, and consists of ten questions. The teacher points to a mark on the scale and each pupil writes his answer on a sheet of paper. These questions cover the entire range of the scale: halves, fourths, eighths, and sixteenths. The results are checked by a show of hands and those needing further instruction are assigned to a new group.

The second side of the scale is used for remedial drill. The teacher points out that the inch mark is the longest on the scale. Then he shows that the inch is divided into two equal parts. He shows the second inch and points out the length and meaning of the fourth and three-fourth-inch marks. This method serves to give meaning to the fractions and helps the student to read the scale through noting the length of the lines. A second drill is now given on the first scale. A written test follows the drill, followed perhaps by another test at a subsequent meeting of the class.

Wire hooks are fastened by screw eyes to each end of the scale so that it may be hung above the blackboard. The scale is 6 in. wide and dividing lines of the following dimensions: one-half-inch marks are 4 in. long, one-fourth-inch marks are 3 in. long, one-eighth-inch, are 2 in. long, and one-sixteenth-inch marks are 1 in. long.

Made to these measurements, the scale is easily seen from any part of the room.

BUD VASE

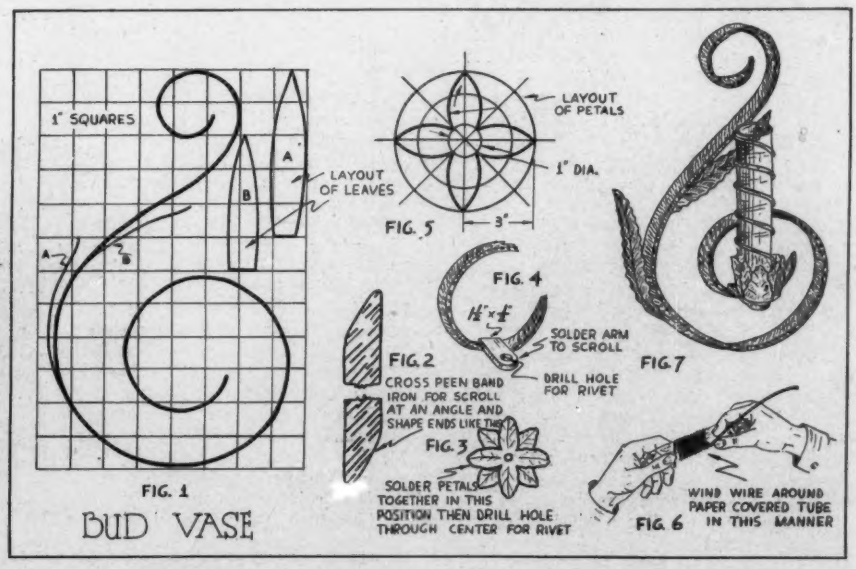
Alvin D. Haber,
Ithaca, New York

The bud vase described and illustrated here is an interesting project in cold metal which may find practical use in adorning that bare wall in the den, living room, or bedroom. Its chief attraction lies in its simple beauty, and in the ease with which it may be constructed. The vase used was a toothbrush container. A test tube or the like would make a satisfactory vase.

For the scroll, use ½-in. band iron. Peen this carefully with a cross-peen hammer at an angle as shown in Figure 2. Cut off the ends with a hack saw and file them to a taper. Then bend the scroll as shown in Figure 1.

Cut the leaves from 28-gauge black iron. The veined and rippled effect is produced by chasing the leaves on a pitch block. Then solder them to the scroll as shown in Figure 1.

The flower petals are made from 28-gauge black iron and a procedure similar to that used in making the leaves. Solder the petals together as shown in Figure 3. Then drill a hole through the center for riveting. Incidentally, brazing or welding may be used



in place of soldering, in making the joints in this project.

Cut the vase supporting arm, Figure 4, from ½-in. band iron. File the corners, of the extending end, and drill a hole for riveting.

The spiral vase holder is made from 16-gauge copper-coated iron wire. To shape the wire spiral in such a way that it will properly enclose the oval-shaped glass tube, wrap three thicknesses of heavy paper around the glass tube, and then wind about 8 turns of the wire around the paper-covered vase. This step is illustrated in Figure 6. Then slip the coil just made from the tube. The two ends of the wire are then grasped with the fingers and the coil is stretched to the length of the vase. It will be noticed that the thickness of the paper has taken up the contraction of the loops caused by stretching. The bottom end of the spiral should be bent around so that a rivet will just fit through it. The spiral and flower must then be riveted to the supporting arm, which in turn, is then soldered to the scroll.

Next, dip the entire piece in oil and blacken it through oxidation by applying a torch. Care must be taken not to melt the joints if solder is used. Then rub the scroll lightly with fine emery cloth.

The vase is then inserted, a few flowers placed in it, and the project is ready to be hung on the wall.

DECORATIVE CHIMNEY IRONS

Robert A. Harris, Green Bay, Wisconsin

The decorative chimney irons shown herewith make an attractive metalworking project. The material used need not be costly, and the work involved may range from simple jigsawing to forging.

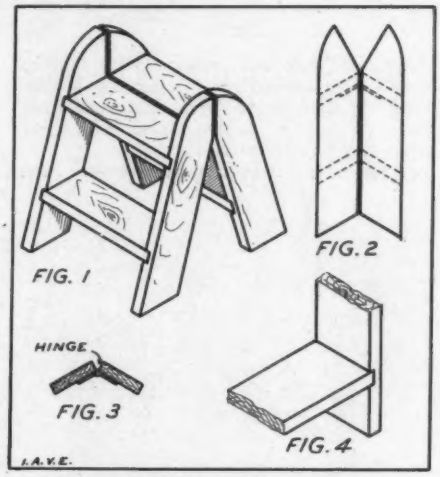
No dimensions are given as the size of the irons will depend upon their location and the size of the chimney. To find the most effective size and position, cut out two or three figures of varying sizes from stiff, black paper and fasten them in position, one at a time, at various heights upon the chimney. One can then stand back from the building and see just how the different-sized irons would appear in position. After determining the proper size, the paper figure is used to transfer the design to the stock. If the iron is to be purely decorative, the stock used may be one eighth inch or less in thickness. It should, however, be made thicker if it is to be used to anchor a tie rod.

After cutting, the iron is peened on one side and given two coats of black enamel. When dry, sand the enamel lightly and apply a coat or two of clear spar varnish to preserve the high lights.

FOLDING STEPLADDER

E. T. Orchard,
Providence, Rhode Island

For those out-of-reach pantry shelves or the higher up cabinets in the workshop, this folding ladder is a great convenience, and with the top step well padded, it finds additional use as a stool. Fold it together and slide it under the bench when it has served its purpose.



The pieces are cut from ¾-in. stock which may be enameled to harmonize with the room in which it is to be used. Joint the parts carefully, nail and glue, and fill nail holes with putty or plastic wood before finishing.

Figure 1 shows the finished ladder. Figure 2 shows its side view when folded. Make the two halves of the ladder and then hinge them together with a pair of sturdy hinges, as shown in Figure 3. No dimensions have been given, since height and width will vary. For general use the upper steps should be about as high as the seat of the average chair.

ASH TRAYS

Arthur F. Ahr, Beacon, New York

Copper and aluminum are excellent metals with which to work in the industrial-arts shop. Many articles which will lend beauty and charm to the home can be designed and made of these materials by the high-school pupil. The only limitation as far as individuality of design and quality of product is the individual's own imagination and ability. Each student may create a tray to suit a particular need in his own home and, in the process of making it, learn some of the fundamentals of art-metal work.

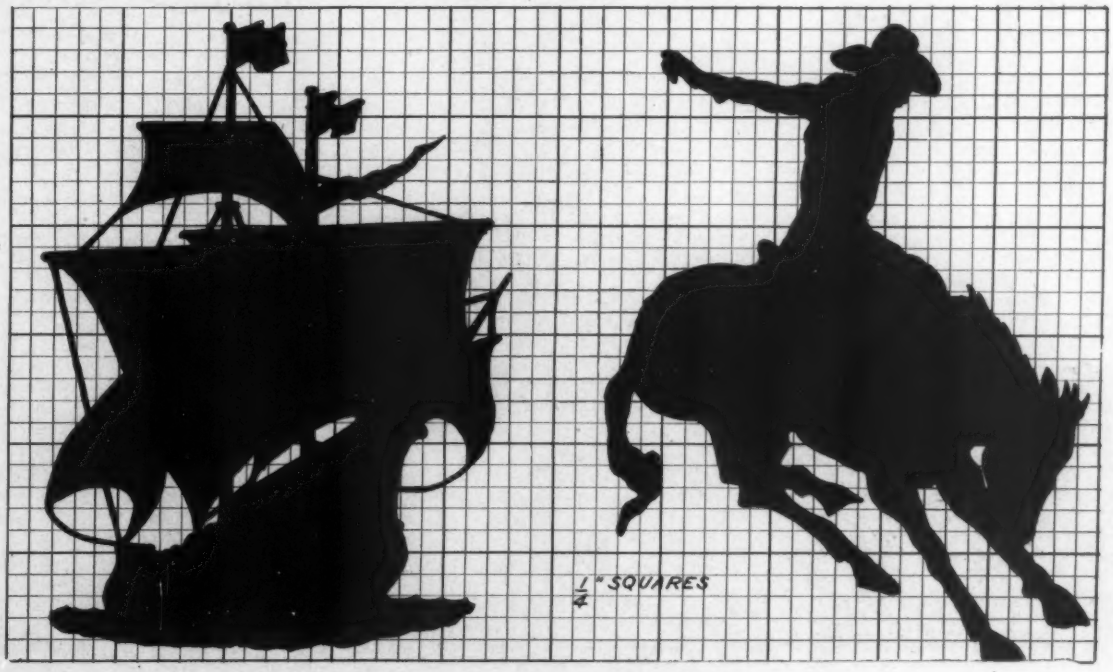
Procedure: Read this whole sheet before starting to work.

1. Make five or six idea sketches similar to those which are given at the end of this instruction sheet. Study methods of ornamentation on models and in reference material. Try to be original.

2. With the aid of your instructor, select the best sketch and make a full-size working drawing within a 5½-in. square, using a 3½-in. diameter cavity. Indicate style of ornamentation. A larger or smaller tray may be made with special permission.

3. Have your working drawing approved by the instructor, then select a suitable blank of No. 18 gauge sheet metal. Check your selection with the instructor.

4. Determine the best surface of the blank; locate the center by drawing diagonal lines with a sharp pencil; using a pencil



Silhouettes that may be used for chimney irons

compass, draw a 3½-in. circle in the center of the blank (see Fig. 1); be careful not to make a deep mark or scratch with the metal part of the compass. Never use a scratch awl, scriber, or dividers in this work unless instructed to do so.

5. Place the blank on a forming block equidistant from each side and, using an 8-oz. ball-peen hammer, strike the copper on four sides just inside of the circle with the ball-peen end of the hammer, as shown in Figure 2.

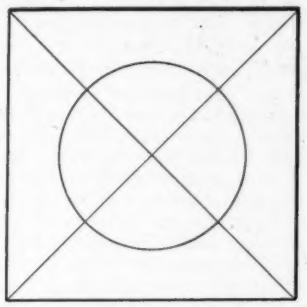


Fig. 1

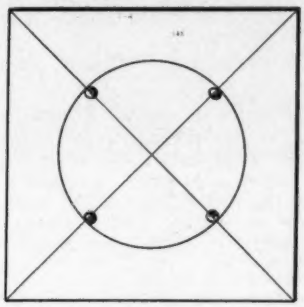


Fig. 2

6. Examine the hammer marks to determine whether the blank is properly centered. If not, center and proceed to beat the metal within the circle into the cavity of the forming block in the following manner:

a) Using light blows, hammer all the way around the form as near the circle line as possible. Hold the copper flat and turn the form as you hammer around the cavity. The hammer blows should be delivered at a slight angle toward the worker, as shown in Figure 3. When the edges curl or wrinkle, flatten them out with a clean, smooth mallet or a block of clean hardwood and a hammer.

b) After beating around the tray two or three times, anneal the blank. To anneal copper, heat to a cherry red color and immerse in cold, clear water. To anneal aluminum, heat slowly and evenly until a splinter of soft pine rubbed on the surface of the metal will burn brown. The wood should not ignite. At this point immerse in cold, clear water. Dry in sawdust.

c) When the annealing process has been completed, place the tray back into the form and proceed in the same manner as in *a*, until it has been beaten down to the full depth of the cavity. Notice the dull thud of the hammer on the copper immediately after annealing. When it begins to ring and feel stiff under the hammer, it is time to anneal it again. Annealing saves time and disappointment. Do not hammer any nearer to the center than is absolutely necessary, as hammer marks in the wrong place are hard to remove. Designs, initials, or emblems are sometimes etched or tooled into the center of the cavity of a tray.

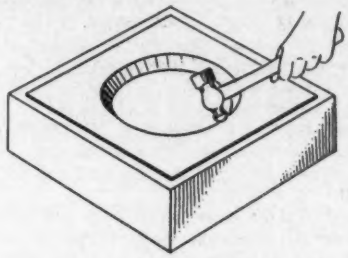


Fig. 3

d) When the metal is beaten down to the shape of the cavity of the forming block, remove the tray and clean it in a pickling bath. Consult instructor for special directions. It is not necessary to pickle aluminum.

e) After pickling, dry and polish the

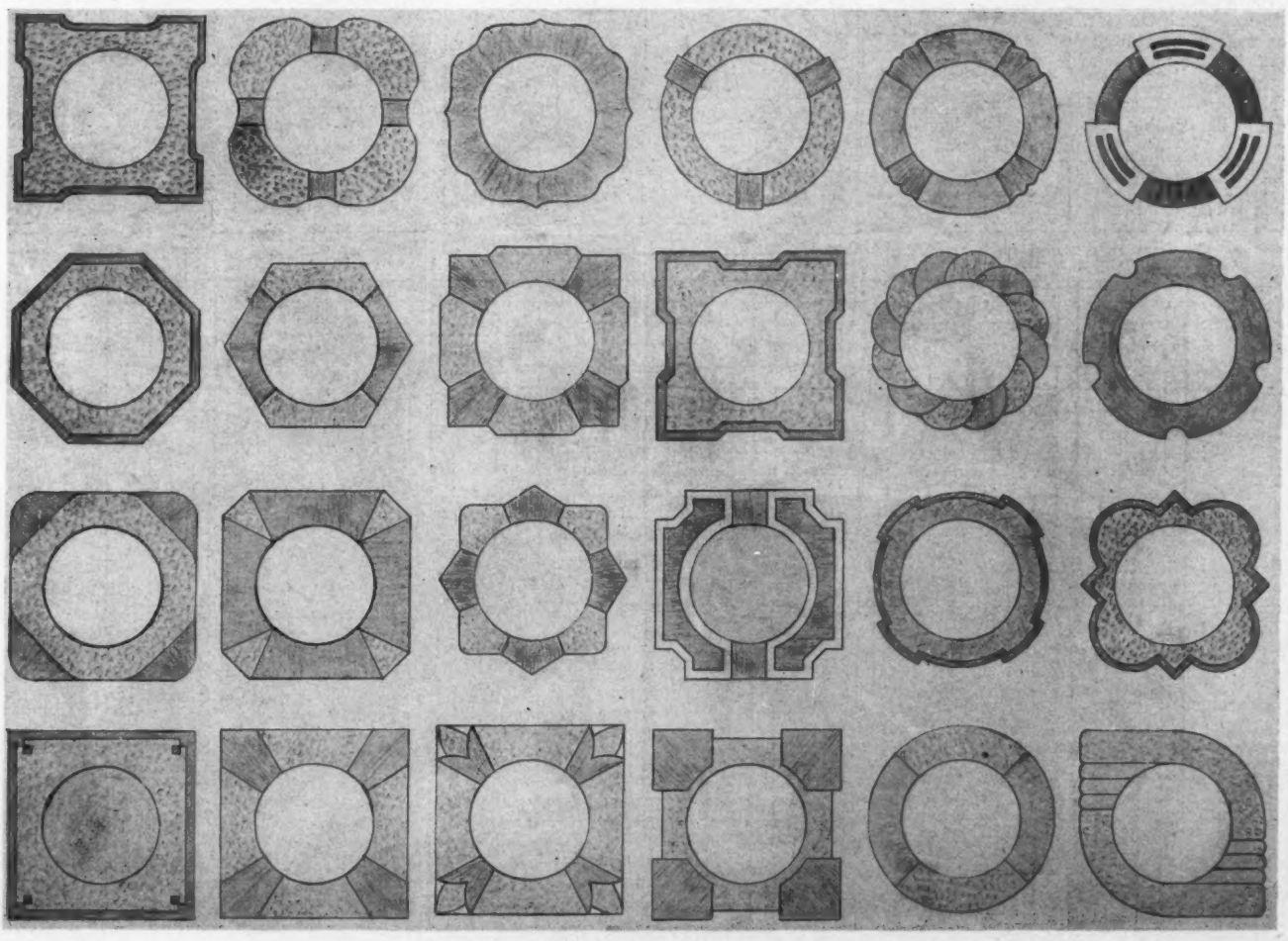


Fig. 4. Designs by the author's students

hammered part of the cavity with No. 0 steel wool until the high spots show.

f) Place the tray back into the form and carefully proceed to hammer down these imperfections. The quality of your product will depend on your skill and patience in this particular operation. A smooth, even finish is the mark of a good craftsman.

g) Carefully flatten the rim of the tray from the cavity to the edge and clean in the pickling bath.

7. The tray is now ready for the design.

a) Either trace the design with carbon paper or lay it out directly onto the metal.

b) Using the proper snips, or saw if necessary, cut out the contour of the design.

c) Dress edges smooth with a fine file and polish with No. 2/0 emery cloth. Do not file or emery the face of the tray.

d) Proceed to hammer, tool, or etch the tray in accordance with the design. Select the proper instruction sheet.

8. To finish tray.

a) For aluminum — polish on buffing wheel.

b) For copper — clean in pickling bath, dry, and polish with No. 2/0 steel wool. Be careful not to touch the surface of the projects with your bare hands.

c) If a bright finish is desired, polish on the polishing wheel and finish on the buffing wheel. While the tray is still warm, rub on a thin coat of floor wax.

d) If a color is desired, immerse the tray in a liver of sulphur solution and remove when the desired shade is obtained. Wash in clear, cold water and dry in sawdust.

e) Bring out the high lights by rubbing with No. 2/0 steel wool or pumice stone and water.

f) Wash thoroughly in hot water and dry with a clean cloth.

g) Finish with coat of clear lacquer. To apply lacquer, fold clean cloth into pad and saturate with lacquer thinner. Put lacquer on pad and rub over entire surface of tray. To eliminate finger marks, hold tray by edges during this process.

Questions

1. Describe the change that takes place in the ductility of copper or aluminum during the process of forming.
2. What precautions should be taken when mixing acid and water?
3. Explain what is meant by the term *annealing metal.*
4. How would you apply first aid to an acid burn?
5. What is the chemical term for the process of coloring aluminum and copper?

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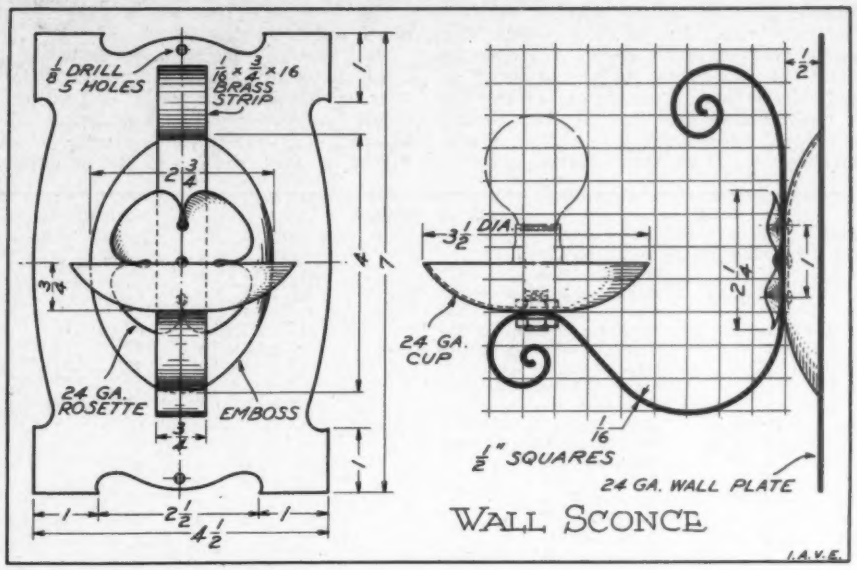
METAL WALL SCONCE

L. C. Petersen, Carbondale, Illinois

This sconce is an ornamental wall bracket to support an electric light. It is made of 24-gauge sheet brass, copper, aluminum, or blued steel. The construction is simple and suitable for the beginner. The wall plate is stiffened by embossing the middle portion to which is riveted the extending arm that supports a cup and a ⅛-in. pipe nipple which passes through the arm and cup and, by means of two nuts, clamps them together. The socket for the light bulb screws onto the nipple through which passes the current-carrying wire.



Objectives: 1. To learn how to apply the principles of harmony and proportion in the design of a useful article so that it may be strong and beautiful.

2. To form an involute curve.
3. To emboss a design.
4. To drill and punch holes.
5. To cut threads with tap and die.
6. To rivet and assemble.

Tools: Vise, snips, punch, ball-peen hammer, ⅛-in. pipe tap and die, sandpaper, and brush.

Materials: 1 pc. 24-gauge sheet brass, 4⅝ by 7⅛ in. for wall plate; 1 pc. 2¼ by 2¼ in. for rosette; 1 pc. 4½ by 4½ in. for the cup; 1 pc. 1/16 by ¾ by 16 in. for arm; 1 pc. ⅛ by ¾-in. pipe nipple; two lock nuts; three copper rivets; fine pumice or rottenstone; clear lacquer.

Procedure: 1. Make paper patterns of the wall plate and rosette, by folding on two axes and cutting symmetrically.

2. Scribe outlines of patterns on the metal and cut to line.

3. Raise the center area of the wall plate a half inch high with a ball-peen hammer, placing the metal on a piece of wood having a concave recess.

4. Drill five ⅛-in. holes on the vertical axis of the plate, three at center for rivets, one at top and one at bottom for fastening to wall.

5. Hammer out the cup to a depth of ¾ in. on a wooden form held in the vise. Punch a hole in the center of the cup and file it to fit the pipe nipple.

6. Hammer rosette into ornamental curved shape and drill rivet hole in the center.

7. Draw full-size curve shape of arm, and bend arm to this shape. Drill a ⅜-in. hole for nipple in outer end and three rivet holes to fasten to wall plate.

8. Fasten the arm to wall plate with rivets inserted from the back through the two outer holes.

9. Insert rivet through rosette and middle hole in arm and wall plate and rivet the three together.

10. On ⅛-in. pipe, cut thread with die for 1½ in., saw off a threaded piece 1¼ in. long, and smooth off all inside edges with a file.

11. Insert the nipple through the cup and arm, and fasten in place with the two lock nuts. Leave ½ in. of nipple projecting for the electric-light socket.

12. Polish all parts bright and clean.

13. Apply a thin coat of clear lacquer.

14. Screw on the socket and connect the wires, and conceal it under arm.

10 FT. BY 26-IN. SAILING KAYAK

James McGregor, Polytechnic Elementary and Junior High School, Pasadena, California

If you have been led to believe in this modern life that to experience thrills, you must live in a state of excitement, then you will explode that theory when you have one of your boys build this or any other sailing kayak. The greatest thrills in life come from the common everyday work, and it is here where we as teachers, have the opportunity of guiding and directing our students to experience those thrills, by planning and directing the building of projects which fit into their lives.

To build a boat with which a boy may learn the rudiments of sailing, and keep the expense account down, is a neat little problem. In an effort to solve this problem, we have redesigned one of our 10-ft. kayaks. The lines remain the same, but construction has been improved to meet the extra strains involved in sailing.

Frame 2 is built up of four pieces of ¾-in. spruce, shaped and notched to receive battens and cockpit framing, and fastened securely with galvanized stove bolts, two at each corner. Frame 3 is made in a similar manner of three pieces of ¾-in. spruce, with the addition of two cleats at the sheer, to provide a secure fastening for the cockpit framing. Frames 1, 4, and 5 are made of solid pieces of ¾-in. spruce, notched to receive battens. If desired and time permits, these last three frames may also be built up of several pieces and bolted together, although this is not essential.

The outside curve of the cockpit framing is made to fit the curve of the sheer battens, but the inside curve is made slightly flatter. This flattening of the curve makes it simpler when it comes to bending the combing round the cockpit.

An assembly is made consisting of two sheer battens cut accurately to length and beveled at the ends, one bow breast hook, and one stern breast hook. A similar assembly is made using chine battens, along with bow and stern breast hooks. These two sheer and chine as-

semblies are then fastened together with bow and stern stems. The fastening is done with casein glue and brass screws. No difficulty should be encountered in bending the sheer and chine battens, if straight-grained material is used. Make a note that the chine battens are ripped down to 5/8 in. to insure against breakage, due to the shorter curve.

The floor comes next and is supported at ribs 1 and 4, by cleats.

The mast-step pieces have to be fitted snugly so as to be sure of strength. Before fastening the mast-step pieces, a 3/4-in. piece should be fastened on the floor boards. The latter has a 2 1/8-in. hole to receive the bottom end of the mast, and has to line up directly under the hole of similar size, above in the mast step. To make a neat job of canvasing round the hole for the mast, install another piece thick enough to reach from the crown of the deck to the mast step. By beveling off this piece to fit the crown of the deck, and continuing the mast hole to the outside, a good place for tacking canvas is formed.

Bill of Material

Part No.	*No. Required*	*Material*	*Size*
1, 4, 5	1	Straight-grained spruce S2S	3/4" x 12" x 5' 0"
2	1	Straight-grained spruce S2S	3/4" x 3" x 3' 2"
	1	Straight-grained spruce S2S	3/4" x 4" x 1' 10"
3	1	Straight-grained spruce S2S	3/4" x 3 1/4" x 2' 0"
	1	Straight-grained spruce S2S	3/4" x 3 1/2" x 1' 6"
	1	Straight-grained spruce S2S	3/4" x 1 1/4" x 0' 7"
6, 7	1	Straight-grained spruce S2S	3/4" x 6" x 2' 4"
8, 9	1	Straight-grained spruce S2S	3/4" x 8" x 3' 4"
10	10	Straight-grained spruce S2S	3/4" x 3/4" x 10' 0"
11	2	Straight-grained spruce S2S	3/4" x 5" x 3' 8"
12	2	White pine S4S	3/8" x 3" x 4' 0"
13	2	White pine S4S	1/2" x 3" x 1' 6"
14	1	Spruce S2S	3/4" x 1 1/4" x 3' 0"
15	6	Douglas fir S4S	3/8" x 1 3/4" x 4' 4"
16	1	Spruce S4S	3/4" x 3/4" x 2' 0"
17	2	Half-round white pine molding	1/4" x 5/8" x 10' 0"
18	2	Straight-grained spruce S2S	3/4" x 8" x 2' 6"
19	4	Straight-grained spruce S2S	3/4" x 4" x 0' 9"
20	4	Straight-grained spruce S2S	3/4" x 7 3/4" x 0' 8"
21	2	Straight-grained spruce S2S	3/4" x 1" x 2' 0"
22	4	Straight-grained spruce S2S	1/4" x 3/4" x 2' 8"
23	1	Straight-grained spruce S2S	3/4" x 4" x 7' 0"
24	1	Straight-grained spruce S2S	3/4" x 5" x 3' 0"
25	1	Straight-grained spruce S2S	3/4" x 3/4" x 10' 0"
26	2	Straight-grained spruce S2S	3/4" x 3/4" x 4' 0"
27	1	Straight-grained spruce S2S	3/4" x 6" x 4' 0"
28	1	White pine S2S	1/2" x 4" x 1' 0"
29	1	White pine S2S	1/2" x 9" x 2' 0"
30	1	Straight-grained spruce rough	2" x 2" x 12' 0"
31	1	White pine round pole	1 1/4" x 1 1/4" x 7' 6"

1 pc.	10-oz. double-filled white duck canvas 48" x 3 1/2 yd.
1 pc.	10-oz. double-filled white duck canvas 48" x 1 yd.
1 pc.	8-oz. single-filled white duck canvas 29" x 3 1/3 yd.
9 doz.	F.H. brass screws 1 1/2" No. 8
1 lb.	7d Galvanized box nails
1 lb.	3d Galvanized finish nails
3/4 lb.	Copper tacks 10 oz. x 5/8"
1 doz.	R.H. Galvanized stove bolts 3/16" x 1 3/4" with washers
8	R.H. Galvanized stove bolts 1/4" x 2 1/4" with washers
1	R.H. Galvanized stove bolts 1/4" x 1 1/2" with washers
8	1/4" Wing nuts
4	Brass screw eyes No. 1206
4	Brass screw eyes No. 1109
1 pc.	Brass rod 3/16" x 8"
1 pc.	Brass bar 1/8" x 3/4" x 12"
1 pc.	Galvanized iron 14-gauge 1" x 12"
1/4"	White cotton rope 50 ft.
	Sail of 8-oz. canvas with gromets, made to fit sail plan
1 lb.	Casein glue
12 1/2 lb.	Zinc compound, or white lead
1 qt.	Lesscoat (canvas filler)
1/2 gal.	Boiled linseed oil
1/2 gal.	Pure turpentine
1/16 gal.	Pigment ground in oil
1/4 gal.	Satin auto oil clear

Painting Specifications for Canvas

1 coat Lesscoat
2 coats zinc compound thinned with linseed oil and turpentine
1 to 2 coats satin auto oil clear, mixed with desired pigment ground in oil, 2 to 3 lb. pigment to one gallon

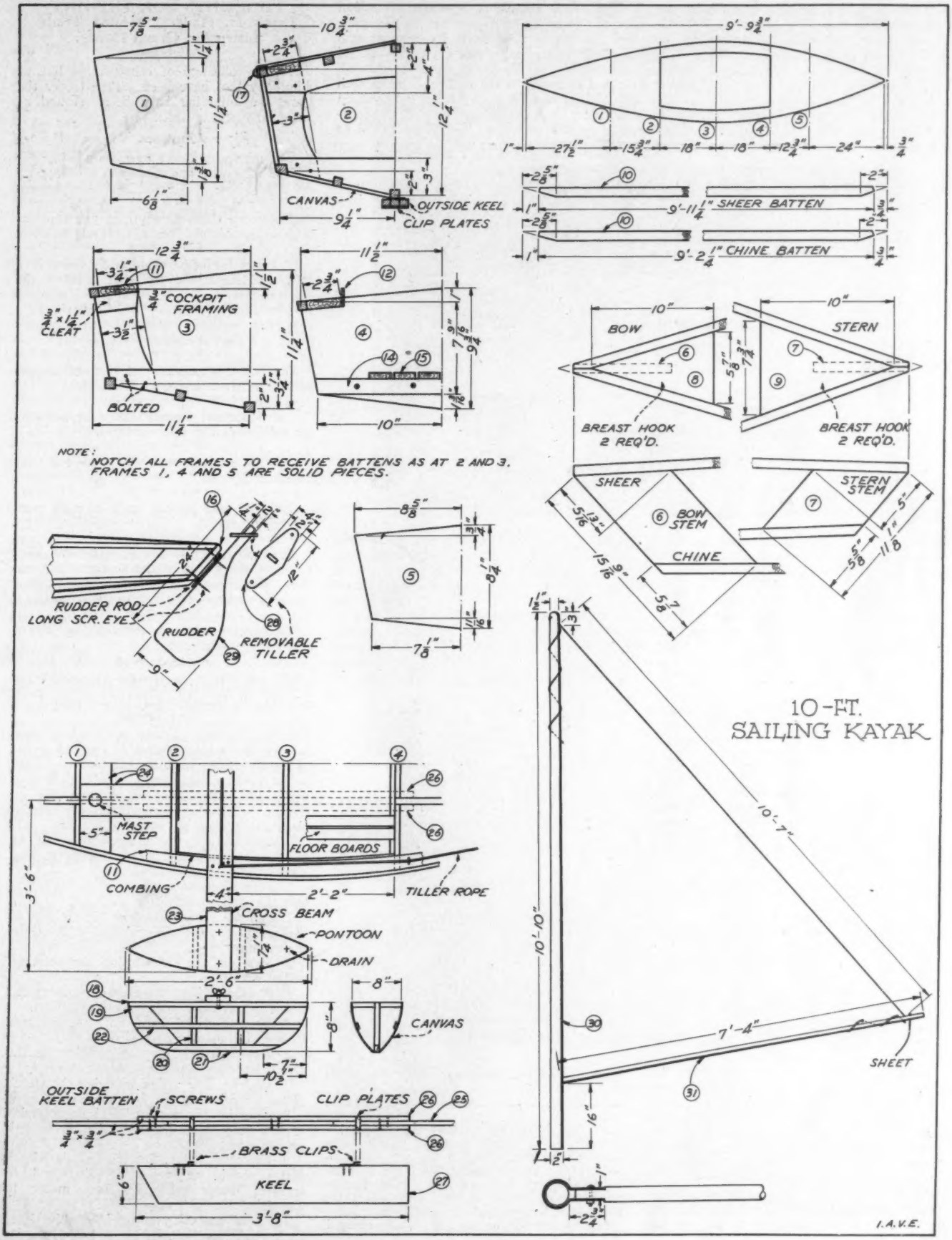
The edges of the cockpit framing have to be beveled so as to fit snugly against the sheer battens. This also makes for a simpler method of fitting, when it comes to installing the cockpit combing, because then the combing will be in a vertical instead of a flared position.

Frames 2, 3, and 4 may now be installed along with cockpit framing, and good close-fitting joints are essential, as well as careful boring and countersinking of screws, to avoid rubbing or wearing holes in canvas which has to follow. Frames 1 and 5 may now be installed.

Battens on the bottom and deck of the boat may now be fitted and fastened. When fitting the inside keel batten be sure that it is put in straight. Locate the position of the detachable keel, and plane off the inside keel batten to form a straight flat surface on the outside of the boat. By doing this, any difficulty of fitting the removable keel later will disappear.

The outside keel may now be tackled. This is formed by three 3/4-in. battens, one long one and two shorter ones, fastened with two brass plates, which are sunk flush with the wood. These plates are held with screws, and no screws should protrude or they will wear holes in the canvas covering to come. Fasten the outside keel in a temporary manner only, as permanent fastening comes after canvasing and painting. The removable keel is held in place by two brass clips which slide underneath the brass plates on the outside keel. A recess deep enough only to receive the brass clips should be made in the outside keel. If the brass plates are sunk flush with the wood, a close-fitting joint along the edge of the removable keel will be obtained, as well as a fine rigid structure.

In selecting material for the pontoon decks, hard material is of no use, because copper tacks will simply bend over when being driven to hold the canvas. Each pontoon is a miniature boat in itself. For that reason accuracy in making them is extremely necessary, particularly where edges of stems fit against the decks. Pontoon ribs are notched to receive the keel. With the exception of the light center battens, pontoon parts may be fastened with galvanized box nails. A small screw at each end of the center battens will hold them securely. There are, of course, two pontoons to be made. On the deck of each pontoon there are two stove bolts anchored in place,



By James McGregor, Pasadena, California

and these must be installed before any canvas is applied. Only one piece of canvas for each pontoon is necessary, tacked along the edge of the deck, cut along the stems, where it is folded in and tacked on the edge of the wood. A half-inch drain hole with a cork is provided in the deck for the removal of water.

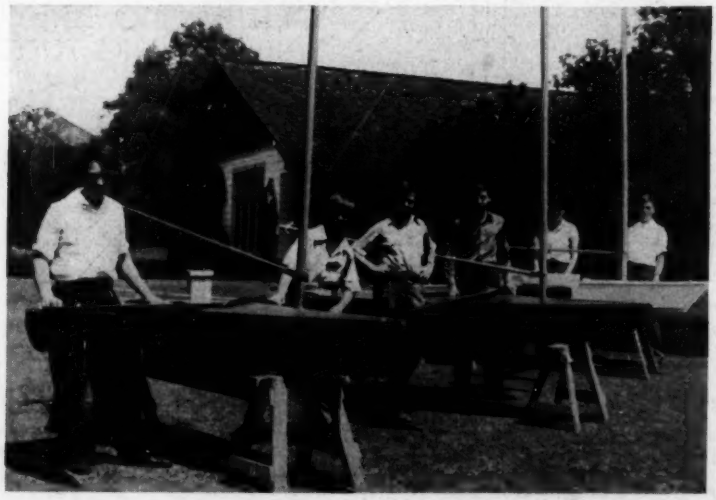
The crossbeam is secured to the kayak with four stove bolts, and on each end of the beam is a pontoon. Wing nuts are used to speed

The sail is something beyond most school shops, due to the special nature of the work, and this can be done better by someone who has facilities and experience for that work. Of lightweight canvas, with gromets inserted, the sail is lashed to the mast and boom with soft cotton rope. A cleat may be screwed on the center deck batten, just behind the cockpit, to fasten the sheet. Some boys prefer to hold the sheet in their hand.

putting together and taking apart. Cockpit combing is notched for the crossbeam, and the beam rests firmly on the cockpit framing.

The rudder is secured with brass screw eyes and a brass rod, and is installed after the boat has been painted. The tiller is made to fit the rudder with a slot in the center. Screw eyes are fastened on the deck of the boat, to guide the rope which controls the rudder. This rope is pulled and fastened tight, and is sufficient

Should there be any difficulty in securing the materials to meet the painting specifications, white lead thinned with linseed oil and turpentine, along with the desired pigment added, may be used. The first coat on the canvas in this case should be thinned with 50 per cent linseed oil. To attain a first-class paint job, and one that will last, there must be ample time allowed for drying between coats. The importance of brushing out the



to control the rudder, being less in the way than a long wood tiller, which would only be in the way of the operator.

The mast is made of a straight piece of 2-in. spruce, tapered and rounded. The whole appearance of the boat can be very easily spoiled by a poorly made mast, and time spent in working to a smooth round finish will be well rewarded. The boom may be bought ready made in the form of a round pole, and is attached to the mast by a piece of galvanized strap iron formed to shape.

paint thoroughly, and not piling it on, should also be stressed.

Information Wanted

One of our readers writes: We wish to issue a medal for industrial arts to the most representative industrial-arts student. Would you kindly inquire from your readers as to a reliable objective way of selecting the student upon whom the medal is to be conferred.

Information will be most thankfully received.

THOUGHTS FOR THE DAY

Lewis H. Hodges, Related Trade Instructor, Grand Haven, Michigan

From a collection of concentrated bits of philosophy that have been gathered over the years, the following have been selected as particularly worth while.

Mottoes

The man who knows *how* has a job.
The man who knows *why* is his boss.
— *Fairman.*

* * * *

If you can think of anything you consider impossible, make up your mind it will be done.

* * * *

In every business organization there is a *pull,* and this is the *pull* that counts — the *pull together.*

* * * *

Making ordinary occasions extraordinary paves the road to achievement.

* * * *

The fellow who waits until conditions are just right never starts.

* * * *

Knowledge and thought without accompanying action are like idle machines.

* * * *

It is not so much your ability as it is your dependability.

* * * *

Soul and sole leather make a good team for getting ahead.

* * * *

The human race is divided into two classes — those who go ahead and do something and those who sit and inquire why it wasn't done the other way. — *Oliver Wendell Holmes.*

* * * *

The joy of creation exceeds the joy of your compensation.

(To be continued)

DRIVER-TRAINING VERNACULAR

G. R. Lindstrom, Hackensack, New Jersey

Driver training, among other items, does involve the actual driving of the car. Some of the directions as to driving technique need to be made quickly, with the minimum of words and with clarity of understanding on the part of both the pupil and the trainer, particularly when the car is in motion.

Standardization of terminology may be helpful in the teaching of driver training. Some useful terms follow:

1. *Turn on ignition:* To turn the switch so that the ignition circuit is operative.
2. *Pull the choke:* To close the air port of the carburetor for the purpose of enriching the mixture.
3. *Step on starter:* Closing the starting-motor circuit.
4. *Flooding:* Too much choke, causing too rich a mixture and fouling the spark plugs.
5. *Neutralize the gear:* To place the gear lever in the no-gear position.
6. *Declutch:* The act of stepping on the clutch lever to disengage the clutch plates.
7. *Clutch:* The act of engaging the clutch plates by releasing the clutch lever.
8. *Grabbing the clutch:* Too hasty engaging of the clutch plates, causing the car to jerk on the start.
9. *Clutch evenly:* To engage the clutch plates slowly to avoid grabbing and to transfer power gradually from motor to chassis.
10. *Low gear:* To engage the shift lever in low-gear position.

11. *Neutralize, declutch, and low gear:* The act of preparing to put the car in motion in low gear.

12. *Accelerate:* To step on or open the gas throttle.

13. *Accelerate evenly:* To make a gradual increase in motor speed.

14. *Decelerate:* To close the gas throttle or to release the foot pressure on the gas throttle.

15. *Clutch and accelerate:* To engage the clutch and simultaneously step or open the gas throttle.

16. *Second gear:* To change gear lower to second-gear position.

17. *Decelerate, declutch, second gear, clutch, and accelerate:* The process of changing from low-gear running to second-gear running.

18. *Neutralize the gear, turn on the ignition, step on the starter, choke; declutch, low gear, clutch, and accelerate; declutch, second gear, clutch, and accelerate; declutch, high gear, clutch, and accelerate:* The entire process of getting a motor car under way from standing position with motor not running to high gear forward.

19. *Reverse gear:* To place gear lever in reverse position.

20. *Declutch, reverse gear, clutch, and accelerate:* To place the car in motion backwards.

DOUBLE FORGE FOR SCHOOL SHOP

W. W. Carlson, Kansas State College
Manhattan, Kansas

The double forge illustrated herein was especially designed for the school farm shop, and incorporated many features which would make it desirable as a project for the students. Each student in farm-shop work at Kansas State College helps to build one. Each semester and summer-school session sees the building of a new one. When the forge is finished it is sold to a high school for enough to cover the cost of material. This experience is quite valuable to the student who will later go into a high school as a farm-shop teacher. He can then build a similar forge with his students. About twenty of these forges have been built and all are giving fine service in the high schools in Kansas.

The blower for the blast is driven by a 3400 r.p.m., ⅓-h.p. constant-speed motor and gives ample blast for the two fires. By using an individual gate on each tuyere, perfect control of the blast is possible for each fire.

Figure 1 shows a corner in the farm shop of the Kansas State College. At the left is shown one of the double forges built by students as a

Fig. 1

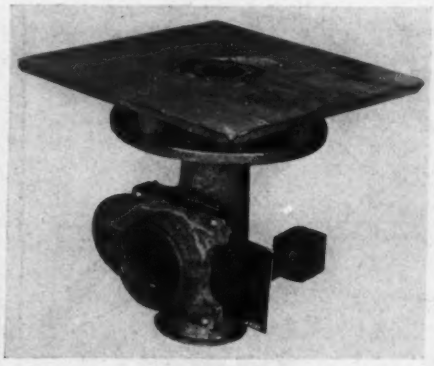


Fig. 2

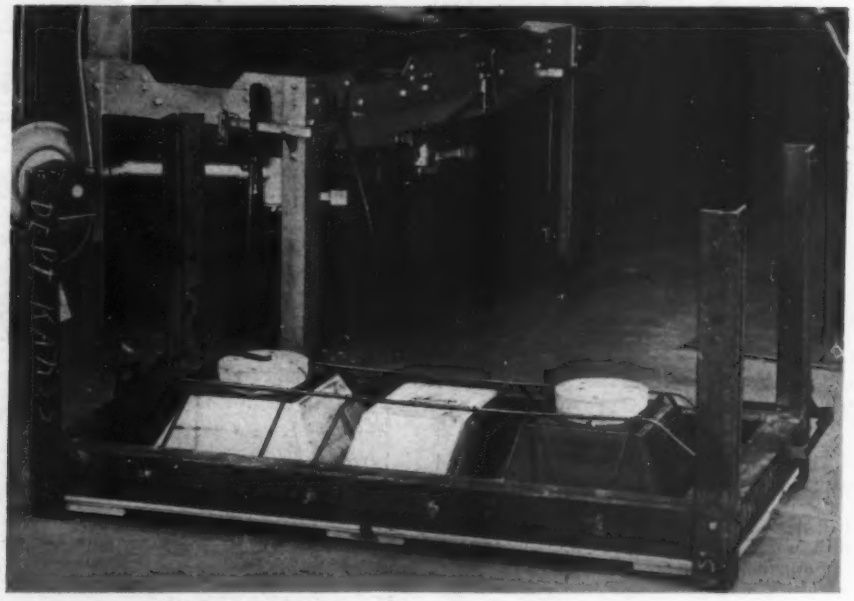


Fig. 3

part of their work in metal in the farm shop. This forge has a 16-in. smoke pipe extending out through the roof. This size is quite satisfactory for the elimination of the smoke.

Figure 2 shows the tuyere irons which are made of cast iron. Each one is provided with a separate gate for controlling the blast, and a cleanout is provided at the bottom with a weighted closure as shown in the photo. This closure can be operated by the foot, and the entire accumulation can be dumped on the floor or into a coal bucket.

The main frame of the forge is made of 3 by 5 by ¼-in. angle iron with 3 by 3 by ¼-in. angle-iron legs. These parts may be fastened together with bolts, rivets, or arc-welded construction. The inside of the frame is filled with a concrete mixture which forms the two fire pots with a coal box in between.

A view of the bottom of the forge frame with the forms in place ready for the concrete is shown in Figure 3. The upper portion of the tuyere iron shown in Figure 2, consists of a heavy cast-iron square plate which fits loosely around the tuyere opening and protects the tuyere and the concrete from the heat of the fire. It has not been found necessary to use any fire clay around the tuyere to protect the concrete.

Figuring new material and no labor expense, the cost for the forge and hood amounts to about $20. The blower with motor costs $25, and the tuyeres cost $8.50 each. The total cost when made in the school shop is then about $62. To this must be added the cost of the smoke pipe from the hood to the chimney. Some teachers will be able to pick up suitable used material for some parts. This will reduce the cost somewhat.

The editor will gladly give information as to where the blower and tuyeres may be bought.

GLASS IN THE INDUSTRIAL-ARTS SHOP

Milton Berlanstein, Oswego, New York

The history of this material starts many thousands of years before the Christian era. It was treasured by the wealthy Romans, fought for by countries, and worked on by the alchemists and scientists of all ages. Today it may be seen in active use on almost every street and corner of our villages and cities, and man *comes in contact with it almost every second of his waking hours.* Strange to say, this is almost completely ignored in the industrial-arts shops.

It is the purpose of this article to present some processes and operations that can be carried on in a school shop with and on glass. The processes described are both interesting and useful. These processes include methods for frosting, etching, and chipping the surface so it will be more attractive when worked into a project or combined with metal, wood, or some other material. There also are descriptions of how the glass may be cut or drilled to fit desired places and shapes.

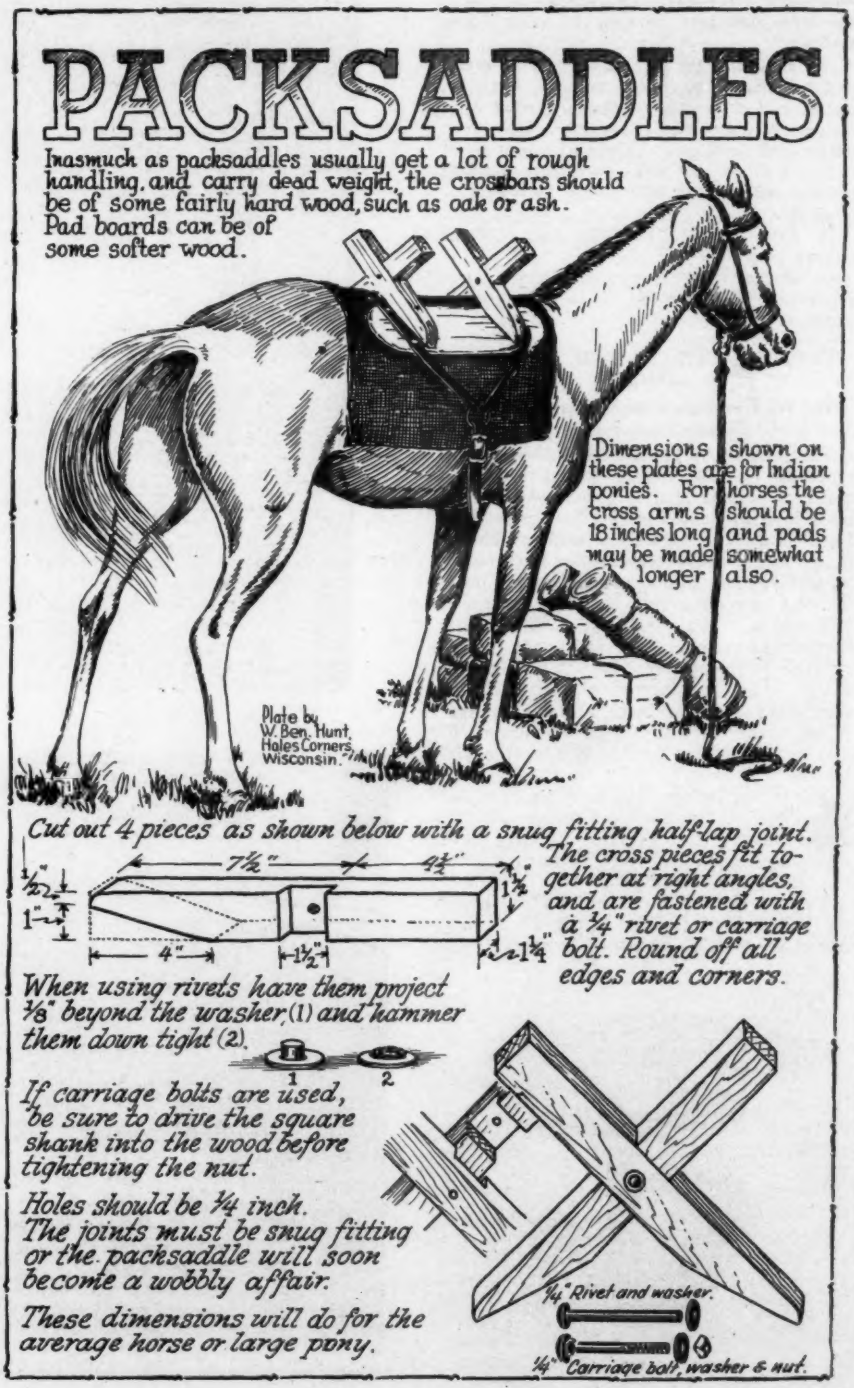
To decorate the surface of glass there may be two methods used: the physical methods and the chemical methods. The physical methods are the first to be considered.

Physical Methods

The first one to be described is a method of frosting the surface by rubbing it with carborundum dust. Figure 1 shows how this is done. Wet the entire surface to be frosted with water. Sprinkle an even, thin coat of carborundum dust over the glass. Then start to rub back and forth over the carborundum dust with a piece of sheet copper. Continue rubbing the glass until the desired frost is reached. The more rubbing that is done, the deeper will be the frost. From time to time it may be necessary to add a few drops of water to the surface to enable the copper to work across it freely. This method is very easy to carry on and also rather inexpensive. The result obtained is an even, light frost which gives the glass a warmth wherever used.

Fig. 1. Matting the glass

Another method that gives the surface a chipped appearance can easily be produced in the school shop. Coat a sheet of clean glass with glue, and then allow the natural strains and stresses caused while the glue is drying to do the work. As the glue dries, it will curl up and as it does so, it takes along with it a sliver of glass. To produce the best chipped finish, the glass may be first frosted with carborundum dust as already described, by one of the methods described later in this article. While this preliminary frosting is not absolutely necessary, yet it is recommended because it gives such good results. Before


PACKSADDLES
Inasmuch as packsaddles usually get a lot of rough handling, and carry dead weight, the crossbars should be of some fairly hard wood, such as oak or ash. Pad boards can be of some softer wood.
Dimensions shown on these plates are for Indian ponies. For horses the cross arms should be 18 inches long and pads may be made somewhat longer also.
Plate by W. Ben. Hunt, Hales Corners, Wisconsin.
Cut out 4 pieces as shown below with a snug fitting half-lap joint. The cross pieces fit together at right angles, and are fastened with a ¾" rivet or carriage bolt. Round off all edges and corners.
7½"
9½"
½"
1"
1½"
4"
1½"
1¼"
When using rivets have them project ⅛" beyond the washer (1) and hammer them down tight (2).
1
2
If carriage bolts are used, be sure to drive the square shank into the wood before tightening the nut.
Holes should be ¼ inch. The joints must be snug fitting or the packsaddle will soon become a wobbly affair.
These dimensions will do for the average horse or large pony.
¼" Rivet and washer.
¼" Carriage bolt, washer & nut.

applying the glue, cleanse the glass thoroughly with a strong alkaline cleanser to free it from grease and oil. Then rinse off with warm water and allow to dry. To prevent chilling the glue while being applied, the glass should be slightly warmed. Then pour on a coat of the warm glue and see that all parts of the glass to be treated are covered. Nothing is gained by using too much glue. When the glue has set hard enough so that it will no longer run off the glass, set the work in a place where there will be a circulation of warm, dry air around it. Support the sheet on blocks. Allow this to remain undisturbed for about 24 hours. By this time, if the conditions of temperature and humidity have been in any way favorable, the glue will peel off in flakes of various sizes. If the coating of glue has been too thin, it may be necessary to apply a second coat over the top of the first and repeat the treatment. If the design produced has a number of wide open spaces on it and you desire a closer chipping to strengthen the effect, repeat the treatment.

For best results in this work, the author recommends "noodle glue," though other forms of animal glue also may be used. The glue should be melted in a gluepot or double boiler and enough used to produce a consistency equal to that of prepared liquid glue.

A few precautions may be in order here. They are: Always wear goggles when going near the glass when it is chipping as the chips fly far and fast; don't run your hand over the glass until it is cleaned after the chipping because of the loose sharp edges that may be on it.

If ornamental marginal designs are wanted on chipped glass it is possible to produce clear margins, clear lines, frosted margins, frosted or clear border designs, or any desired combination of the two effects. When the margin, lettering, or design is to be in clear glass, the required pattern is protected from the frosting material and the glue coating with wax is described later in this article. The process described then affects only the surface that is exposed and when the work is finished, the clear glass design stands out clearly.

The grinding of glass may also be carried on to a small extent in the school shop but the preparation and danger involved are great and therefore we shall not consider them in this article.

Chemical Methods

In the chemical methods of decorating glass, hydrofluoric acid preparations, liquid commercial preparations, and lastly the cream preparation may be used. All of these preparations etch the glass. If applied directly to the entire surface of the glass they will produce a pleasing frost, or if a design is worked on the glass with the proper resist, the chemicals will etch the exposed glass, leaving the designs in clear glass.

If working with hydrofluoric acid there are hydrogen fluoride fumes set free that are very poisonous. Several chemists have been killed while working with this acid. So when working with it make sure it is done out of doors or under an outlet hood or some place where there is *very good* ventilation. It is probably best not to use it in the school shop at all.

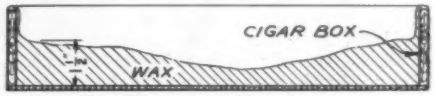


Fig. 2. Etching box

A simple etching box for use with hydrofluoric acid is shown in Figure 2. This consists of a cigar box lined with wax and then filled for a distance of 1½ in. with wax. Make the wax slope toward the center of the box. When a piece of glass is all prepared to be etched, the top of the wax is heated until it is soft enough so the glass can be pressed into it leaving the surface to be etched exposed. All that must be done now is pour the acid on the glass and stand the box out on the window sill until the action is completed. For larger work a larger box must be made.

To prepare the glass for the etching, it is first thoroughly cleaned. To do this, submerge the glass in sulphuric acid for a few minutes and then wash with clean warm water. Cover the glass with a thin layer of paraffin by heating it carefully over a small bunsen burner flame and spreading the paraffin slowly until a thin, even coat is over the entire glass. This paraffin coating on the glass may also be produced by painting on hot liquid paraffin with a brush. When the wax has hardened cut the design through to the glass. Where the wax has been *removed* the acid will act. To produce heavy lines, a jackknife or stylus set may be used. For fine lines, a needle or engraving tool may be employed.

The actual etching may be accomplished either with a vapor or an aqueous solution.

The vapor gives a rough surface where the glass is exposed to its action while the aqueous solution makes smooth, deep impressions. It is very difficult to use the vapor method with the limited laboratory facilities found in the school shop, so it is the more dangerous of the two. For the purpose of the industrial-arts shop, if fluoric acid is to be used at all, the aqueous method is more convenient.

The aqueous method may be used with several concentrations of acid. The prepared glass, which is placed in a wax-lined box, is placed under the hood or cut on the window sill and the acid solution is poured over it so that it covers all the glass to be etched. The acid will eat away the glass slowly and when the proper depth has been reached, the acid should be drained off and the glass thoroughly washed to remove all the acid. A stream of hot water will remove the acid and the wax.

The following hydrofluoric acid solutions produce an equal depth of etching on the same type of glass in various lengths of time:

Concentrated HF	12 minutes
1 part HF to 5 parts water.....	30 minutes
1 part HF to 1 part water.....	20 minutes
5 parts HF to 1 part water.....	15 minutes

Of the above-mentioned solutions the one that produced nice sharp lines in the fastest time was the solution of 1 part HF to 1 part water. The concentrated HF, though it acted very fast, produced very irregular lines. The 1 HF to 5 parts of water, also is a very fine solution for the shop.

All the four solutions mentioned will produce deep lines in the glass and the work produced with them are commonly referred to as deep lined etches. The results obtained, are similar to those produced by the sand-blast or by grinding; namely, a snow-white, translucent glass.

In connection with the foregoing, there are a few precautions that must be observed: When mixing the solution, *always add the acid to the water*. When using hydrofluoric acid, do so only in a well-ventilated place. Do not let the acid get on your skin as it will cause a wound which is very painful and very difficult to heal. As all the solutions mentioned eat away glass, they must be stored in wax or lead containers.

There is another solution that may be used when a matt or dulled surface is desired. This consists of: Ammonium fluoride 5; hydrofluoric acid; water 5. This mixture is best applied with a brush.

There are on the market a few "commercial" preparations that may, most conveniently, be used in the school shop. The preparations sell under the names of "Jack Frost," "White Acid," etc., and may be purchased from your local chemical supply house.

The general directions for using these commercial compounds are something as follows: Immerse the ware to be frosted in the compound for from 30 to 90 seconds (depending on the type of glass). Remove, wash with cold running water, and allow to dry in the air. This is all that has to be done to produce a fine, even etch or matt that is mellow in texture.

There are, of course, quite a few advantages of these commercial preparations over the others previously mentioned. Some of these advantages are: it comes to you fully prepared in liquid form and ready to use — no mixing required; it is always chemically uniform; no special lead-lined equipment is necessary; it will not deteriorate and therefore you can use it until it is gone; it has no harmful or unpleasant odor.

The last type of material that shall be considered for decorating the surface of glass is a cream that comes in small tubes. This is known commercially as "Etchall." This is perfectly harmless cream that is ideal for putting initials and small designs on glasses, ash trays, mirrors, watch crystals, etc. It is not very good for large work as it is quite expensive and awkward to apply in large amounts. There are stencils that are used as resists for this cream that may be purchased from local arts and crafts supply shops along with the "Etchall."

As complete directions for its use are included with each tube, there is no need to explain the process further.

Cutting and Drilling Glass

Thus far this article has concerned itself entirely with the decorating of glass, so that it may be more attractive when used with other materials such as metal and wood, or that it may be more beautiful when used by itself. It is well, therefore, to take up a few very elementary methods of cutting and drilling glass so that the decorated glass may be fitted to the desired place.

For cutting glass in the school shop the familiar wheel cutter is recommended, as it is inexpensive and easy to operate. To do the actual cutting, the cutter should be held between the thumb and the third finger, with the second or index finger on the top to apply the pressure needed. The cutter should slope a little toward you, but it should be perfectly upright laterally. Now draw the cutter toward you hard enough to make it just grip or bite the glass. *If it leaves a mark which can hardly be seen, the cut is a good one,* but if it scratches a white heavy line it is unsatisfactory and one of the three following reasons may be the cause: (1) The tool may be faulty; (2) *you may be pressing too hard;* (3) you may be applying the pressure to the wheel unevenly and at an angle to the direction of the cut. When the cutter leaves the line of cut and skids across the glass, the third reason is usually the cause.

As to pressure, all cutters begin by pressing much too hard. At the beginning of the cut a little pressure is applied to make the cutter bite the glass. For the remainder of the cut *the pressure should not be increased.*

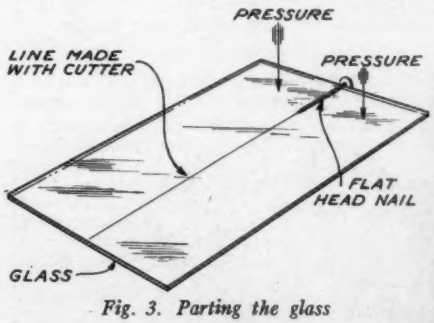


Fig. 3. Parting the glass

The cut should be almost noiseless, you should not hear any grating. When the proper cut has been made you can only see it by holding the glass sideways to the light and you will see a silver line quite continuous.

Having made the cut, the next thing to do is part the two pieces. If the pieces of glass are not more than about 12 inches in length, the method pictured in Figure 3 is a most accurate one to use. Place the edge of the glass immediately under the end of the cutter line over the shank of a flathead nail. A small size nail works best. Now very slowly start to apply pressure to the glass on both sides of the shank of the nail. If the cut was made properly the break will be a sharp, clean one. If the piece of glass is larger than a foot in length, the two pieces are parted by tapping the glass under the line made with the cutter. These taps are to be snappy, firm ones. After tapping, place the glass along the edge of a flat table with the cutter line directly above the edge and on top of the glass. Now start very slowly to apply pressure to the part of the glass extending over the edge of the table. This will cause the glass to break along the cutter line.

To bore holes in glass so that it may be screwed to some other material the following method is fast and convenient to employ. Grind the end of a triangular saw file or square file into the shape of a pyramid making the sloping surfaces at an angle of about 50 degrees. When the spot to be drilled has been located put some putty or artist's clay over it and make a depression in its center exposing the glass where the drilling is to start. Now fill this depression with turpentine. Place the glass on a piece of felt or on a stack of papers or on a piece of heavy cloth and start to drill. This drill may be held in either hand or in a breast drill or in a drill press. Regardless of which method is used, *do not use a great deal of pressure or the glass will break.* A little practice will teach the proper pressure. When the drill begins to work through, the glass should be turned over and the hole finished from the other side. This method may be used to drill holes up to approximately $\frac{3}{8}$ in.

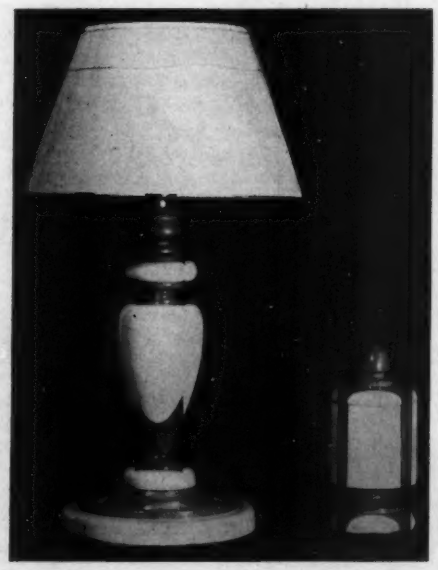
TURNED TABLE LAMP AND HUMIDOR

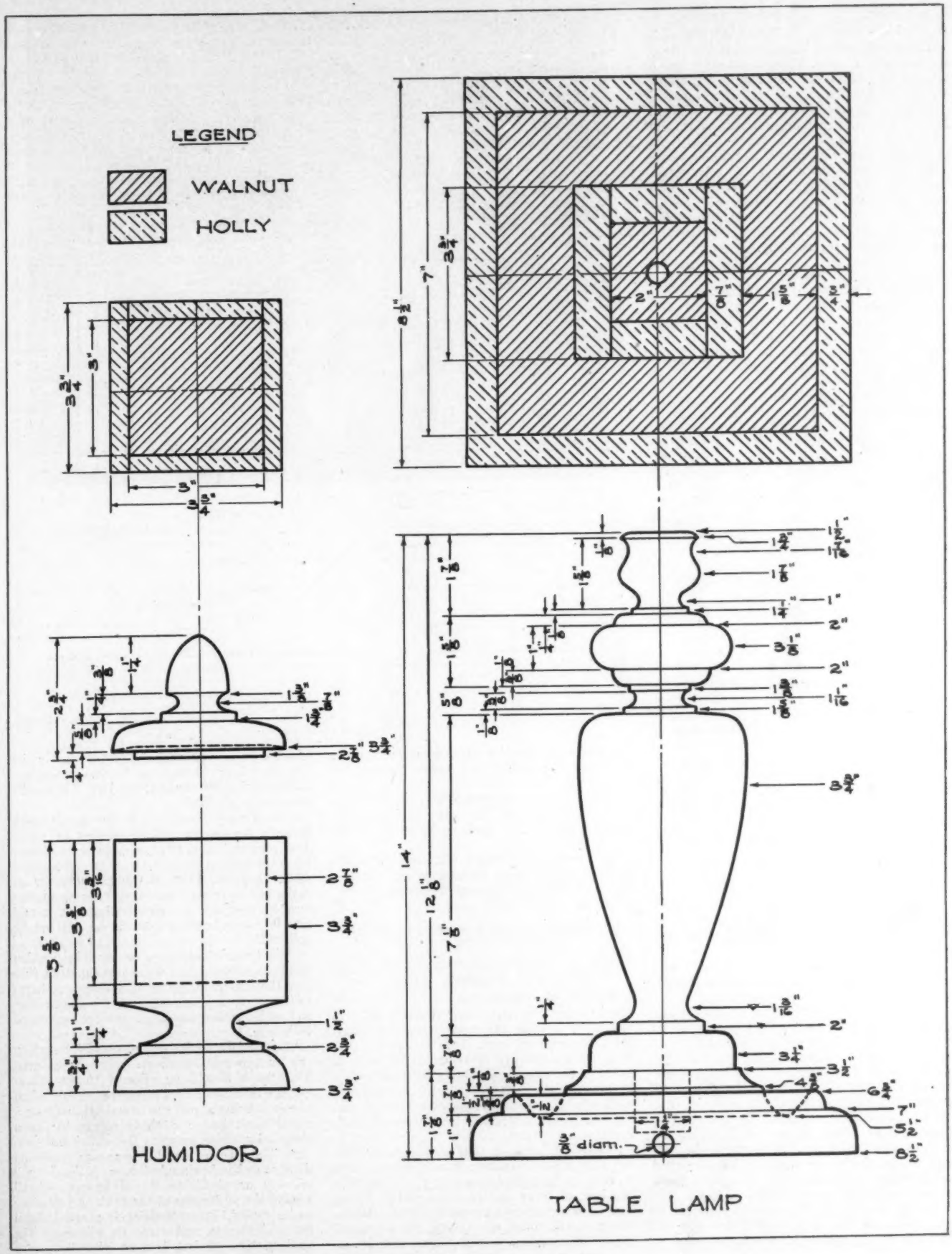
Loring F. Snook, Ames, Iowa

The two projects described and illustrated herewith may be made by any advanced wood-turning student who has had previous work in sizing, surfacing, and gluing stock. A great deal of caution must be used in the selection of stock so that all materials used are equally well seasoned. The gluing of the pieces must be done carefully with a good quality of hot glue.

The following operations are encountered in the production of these projects:

1. Selection of stock.
2. Sawing.
3. Surfacing.
4. Working to exact dimension.
5. Gluing.





By Loring F. Snook, Ames, Iowa

6. Designing.
7. Faceplate turning.
8. Spindle turning.
9. Wood finishing.

The woods used in these projects were holly (*Ilex opaca*) a white, fine-grained wood which takes a high finish, and black walnut (*Juglans nigra*) the premier cabinet and inlay wood of our native, darker colored species. Its dense hard character, rich reddish-brown color, and susceptibility to a high finish justify its popularity. Any combination of suitable close-grained cabinet woods may be substituted. Reversing the order in which these woods were assembled gives an attractive group of projects. The matter of arranging and combining various woods affords an interesting opportunity for the boy.

Table Lamp

The center portion of the upright standard is a piece of walnut stock 2 in. square and 14 in. long. The 5/16-in. hole running through the center of the standard, to carry the electric-light cord, should be plugged so the material may be centered on the lathe. Refer to the plain view of the lamp, which shows how the two woods are glued up to give the ultimate effects. Four pieces of holly are glued around the center piece. The built-up stock is then ready for turning. Use care to see that all thicknesses are uniform, and the stock is exactly centered or the pattern will be unbalanced.

The lower part of the base is of holly with walnut glued on top. These are glued together and then fastened to the faceplate with the walnut to the outside. Turn as shown in the drawing. When finished, bore a 1¼-in. hole through the center to receive the dowel of the standard.

The lamp may be finished on the lathe by French polishing. Use care when gluing the base to the body of the lamp.

Humidor

The center piece for the humidor is a piece of walnut stock 3 in. square and 10 in. long. Four pieces of holly are glued around it. The entire humidor is turned from one piece of built-up stock and cut apart as indicated in the drawing. The tail center is moved up and the lower compartment hollowed out. Care must be taken or the work will be marred when the center part is cut out. The lid is finished on the faceplate.

Finish the same as the lamp.

A MEMORANDUM PAD

H. W. Hess, Urbana, Ohio

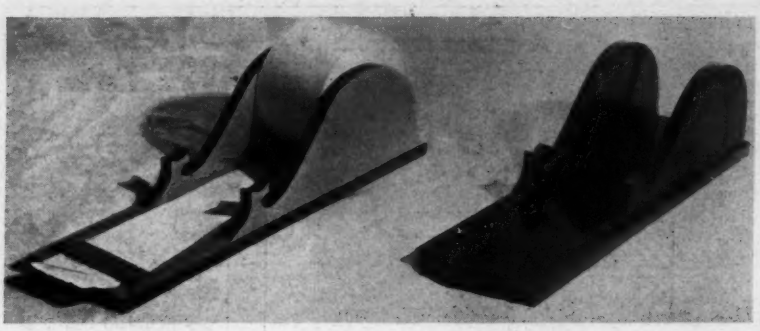
This is a good project for a boy and his dad or for the fifth- or sixth-grade student in school. It uses a roll of adding-machine paper for the pad.

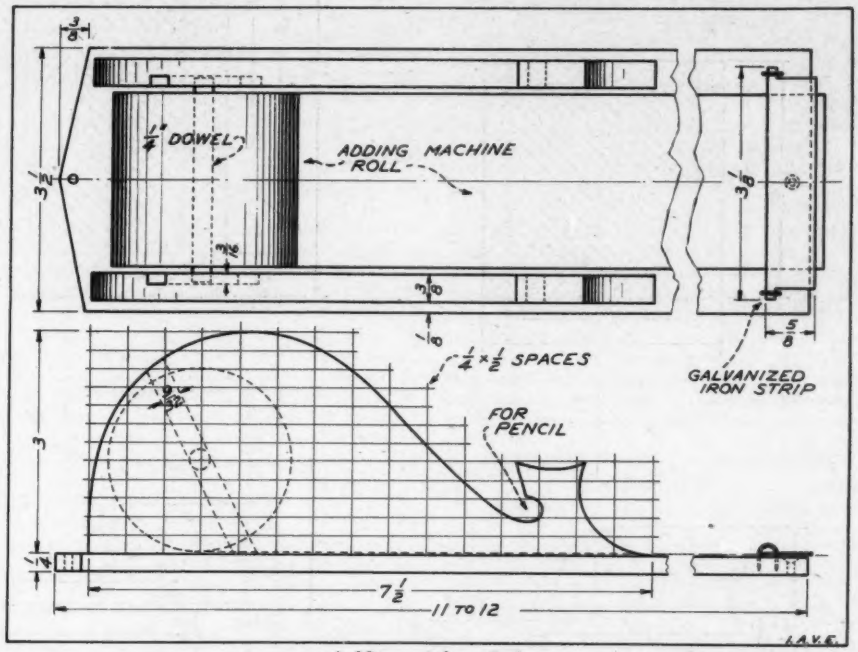
It teaches surface planing, edge and end planing, coping-saw work, designing, metal-working, and finishing and decorating.

Each boy can use his own design for the back. A little bit of friendly rivalry may be engendered by proper encouragement.

Make a pattern for the sides, cut the sides with a jig saw or a coping saw, and cut the groove for the piece of dowel that holds the paper. This can be marked out with the help of a T bevel and sawed to the line with a piece of scrap wood on the line clamping the side to the bench top. This guides the saw and insures the wood against being scratched up. A boy gets discouraged if he spoils a piece of work when it is nearly done.

Locate with a pencil where the sides are to be placed on the back, also a line for the nails. Start the nails, put a trace of glue on the edges of the side pieces, and nail them in place. Test for squareness before the glue dries.





A Memorandum Pad

Cut a piece of galvanized iron for the piece used for tearing off the paper and staple in place. This piece is loose to allow the paper to be grasped easily.

Decorate to harmonize with the surroundings. It is a handy kitchen memo for the boy's mother and a very satisfying project to finish at Christmas time.

RUBBER MOLDS FOR PLASTER CASTS

Leslie J. Miller, Ardmore Junior High School, Villa Park, Illinois

The art of making casts from molds interested the ancient Greeks and Romans and still fascinates a large per cent of people today. Such progress has been made in this art that it is now possible to make molds or casts or both, in the school shop or in the home. It is even possible to borrow a statuette or buy one with a slight defect, remedy the defect and make a mold from it and then make as many casts as one wishes.

Molds can be made of plaster of paris, wax, sulphur, glue, or rubber. Elastic molds seem to give the best results and the rubber mold is the best of them all. By using rubber, copies can be made of articles made out of plaster, stone, metal, china, wood, clay, pressed wood, glass, soap carvings or wax. People who are interested in soap carving should find joy in the fact that their carvings can be duplicated in a hard and durable material and that this can be done quite cheaply.

The writer likes to fill the molds with Keene's cement instead of plaster of paris. This cement is about the same price as plaster when bought in quantities, gives a beautiful white cast, sets more slowly than plaster of paris, and is more durable. A coloring matter may be used in the cement to streak it and give it a marble effect and the cement can be polished.

This material can also be used in wooden molds and turned in a wood-turning lathe (before the cement dries too hard) without harm to the wood-turning tools, but it is the making and use of rubber molds that we are concerned with here.

The project to be copied should be given one or two good coats of shellac or lacquer. This finish should be allowed to dry thoroughly, of course. This is especially true when one is copying a piece of metal statuary or a metal book end for there seems to be a chemical reaction between the metal and rubber. The shellac or lacquer also prevents damage to hand-painted plaques. A slender roll of clay or plasticine should be pressed all around the underedge of the book end or piece to be copied. This plasticine is pressed down flat and smooth and made to adhere to the project. The project is then placed upon a

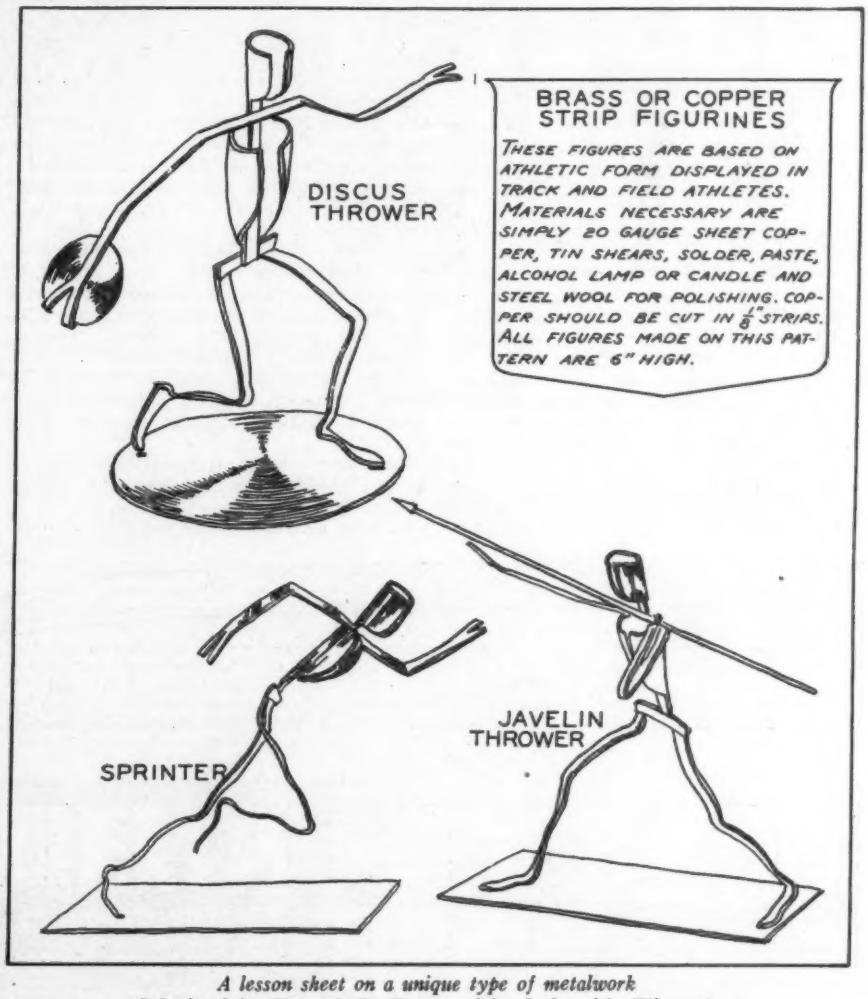
Articles cast in rubber molds

piece of glass and enough pressure applied so that the book end adheres to the sheet of glass and is mounted so that it will not move. The next step is to take a knife and trim away any surplus plasticine which may have been squeezed out. The plasticine or clay will then form a continuation of the book end and will not show as a bond between the two. Care must be exercised which face of the project is selected to face the glass for that face will be the open side of the mold.

After the object is securely mounted the next step is the application of the rubber. The rubber comes in liquid form, in sealed jars, and must not be exposed to the air for any length of time. This material hardens when exposed to air and so must be kept in airtight containers. The liquid can be applied with a spray or a brush. The beginner had better use a brush. Each coat should be thin. The coats should be applied evenly and smoothly, taking care not to let any bubbles form. If bubbles do form on the surface of the rubber they can be blown out with the breath. Bubbles might cause holes in the mold. Each coat must be allowed to dry before the next one is applied. The length of time for each coat to dry depends upon the temperature of the room and its humidity. Sometimes the coats can be repeated every three or four hours. Coloring matter is generally added to the rubber so that it is easier to tell when it is dry. Successive coats must be applied and allowed to dry until the mold is as thick as is wanted. From five or six to ten or twelve coats produce some pretty good molds. If the mold is too thin it will not produce good casts and will not last long. If the mold is too thick it will not stretch easily and it will be difficult to get the cast out of the mold. If the rubber does not stretch easily, the cast is often broken in getting it out of the mold.

If a rubber mold were to be filled with a heavy material like plaster of paris or Keene's cement, it would stretch and the cast would be ill shaped; so, the mold must be protected and kept from stretching when filled, by the use of a plaster of paris casing. While the statue, plaque, or book end is still mounted on the glass and is covered with the rubber coating, the rubber mold just formed is oiled or greased and is covered with plaster of paris. After the mold is oiled and before the plaster is poured, the whole thing is walled in to hold the plaster when it is poured. A plaque or flat object is easiest to make a casing for and should be attempted first by the beginner. For a plaque, make the casing by using tin or heavy cardboard to *wall* it in. The wall should be a little taller than the plaque is thick. Surround the rubber-coated plaque with the wall and leave quite a little margin between the plaque and the wall. Build up with clay at the edge of the wall and glass on the outside so that the plaster will not run out under the wall. Mix the plaster to about the consistency of cake dough and pour in until the wall surrounding the plaque or rather the enclosure is full. When the plaster is good and dry, the casing can be lifted up and the rubber mold removed from the original. When a casing is made for a statue or some other irregular object, it is necessary to fill in the *undercuttings* with clay to facilitate drawing the cast, and it is also advisable to build clay walls or partitions and pour the casing in at least two parts.

After the molds and casings are made, take out the original copy, wash the mold, be sure that the inside is wet to prevent the cement from sticking, put the mold inside the casing, put heavy rubber bands around the parts, or


BRASS OR COPPER STRIP FIGURINES
THESE FIGURES ARE BASED ON ATHLETIC FORM DISPLAYED IN TRACK AND FIELD ATHLETES. MATERIALS NECESSARY ARE SIMPLY 20 GAUGE SHEET COPPER, TIN SHEARS, SOLDER, PASTE, ALCOHOL LAMP OR CANDLE AND STEEL WOOL FOR POLISHING. COPPER SHOULD BE CUT IN 1/8" STRIPS. ALL FIGURES MADE ON THIS PATTERN ARE 6" HIGH.
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SPRINTER
JAVELIN THROWER

A lesson sheet on a unique type of metalwork
Submitted by Kenneth R. Kuemmerlein, Ladysmith, Wisconsin

tie them together with strong cords if composed of two or more parts, and then the mold is ready to pour. The Keene's cement needs only to be mixed with water. Mix about the consistency of cake batter and pour into the mold which is inside the casing. The length of time the cast needs to remain in the mold depends upon the nature of the cast. Some pieces such as plaques from an inch to two inches in thickness can be taken out in three hours while a small statue or an ash tray may need to remain twenty-four hours. One should not forget when pouring the mold full, that the mold and casing should be jarred to prevent bubbles forming in the cast. Bubbles in the cement as it is being poured will probably mean an imperfect cast.

There are a number of finishes that may be used on these casts. Before attempting any finish, the pores of the cement should be sealed with shellac or clear lacquer. The bronze or antique copper makes a nice finish for small statuary. Another finish that is quite popular with the students is an antique ivory. Any high-grade quick-drying enamel in the ivory color should give good results if the pores are sealed before its application. The antique effect is produced by covering the enameled project with burnt umber and rubbing off the surplus leaving the depressions full of the dark color and rubbing up the high lights. Rub across the depressions and not with them.

The author wishes to give credit to Mr. L. Braaten, now teaching at Benton Harbor, Mich., for helping to develop this type of work before it was introduced into the Villa Park schools.

CARVED-WOOD PENHOLDER

H. S. Fox, Lexington, Kentucky

The illustration shown herewith, presents a novel penholder that may be carved from mahogany, walnut, cedar, or any other kind of wood.

The piece chosen should be 2 by 2 by 15 in. The face and the side of the block should be squared off in inches first, and the outline of the feather drawn as shown.

The penholder should then be rough carved until it is close to the shape of the design, but before the quill end of the feather is cut down to its final size the opening to receive the steel pen point should be made in the penholder. This can be done best by taking an old pen point the size of the one to be used, and grinding the end that goes in the penholder to a chisel edge. This is then forced into the wood at the quill end of the feather to a depth of 3/8 in. and then removed. If this were done when the pen is carved down as small as it will be when finished there is danger of splitting the wood.

The carving is then completed, and smoothed with fine sandpaper, or No. 4/0 steel wool. The wood surface may be finished with shellac and wax, or lacquer; or in any other manner that the craftsman may desire. Complete by inserting a new steel pen point in the opening previously made.

GRAVURE NOT COMPETING WITH LETTERPRESS

Notes by R. Randolph Karch, Technical Supervisor, Department of Publishing and Printing, Rochester Athenaeum and Mechanics Institute, Rochester, New York

"The process of gravure is not encroaching on the work of the letterpress printer." So stated Alfred M. Geis, manager of the Baltimore plant, Alco Gravure, Division of Publications Corporation, before the Rochester Club of Printing House Craftsmen and the Department of Publishing and Printing, Rochester Athenaeum and Mechanics Institute on November 20.

Mr. Geis explained in detail the processes necessary in the production of gravure. In the usual work, newspapers send only original photographs and proofs of type matter, along with a tracing layout keyed with photo numbers. All other work is done in the gravure plant.

No Make-ready: None of the usual difficulties, such as are found in letterpress are encountered. No make-ready exists, such as the letterpressman uses. Within five minutes after the cylinder is placed on the press the run begins. The one roller for each cylinder often lasts as long as five years. Sheets are dried over a heated drum. Various equipment allow the printing of three colors and black, and perfecting is accomplished, as well as folding to tabloid newspaper size. From that point other binding may be done.

Many Products: Types of products adapted to gravure include: textiles in common cloths, silks and fabrics, soap wrappers, glassine, cellophane candy wrappers, metallic papers, box linings, wallpaper, and the usual run of "roto" newspaper sections, broadsides, scenic booklets, catalogs, postage stamps, radio dials, etc.

Questions: Following the dynamic presentation by Mr. Geis, a "question" period followed:

1. How deep are cylinders etched? Answer: Up to .0045 in., on the plate, which is about .005 in. thick.

2. Does all the ink come from the etched cells? Answer: Practically, yes. Suction does this work.

3. Why is most newspaper gravure in brown? Answer: It is a good neutral color for the illustrations, although any color ink may be used.

4. At what speed can gravure be printed? Answer: The average speed is about 36,000 per hour on rotary presses. On sheet fed, the speed is about the same as letterpress machines.

5. Why does gravure have that moist effect? Answer: In newspaper work, much of this is caused by the naphtha in gravure ink cutting into the oil ink of the letterpress sections of the newspapers.

6. Do you have trouble in reproducing serifs on type? Answer: No, we can now get a good result with a 6-point serif — in fact, we can get a very good 6-point reverse plate.

7. What is the standard line screen? Answer: The 150-line on rotary; and up to 225 in sheet fed.

8. What is the life of a plate? Answer: 700,000 to 1,000,000.

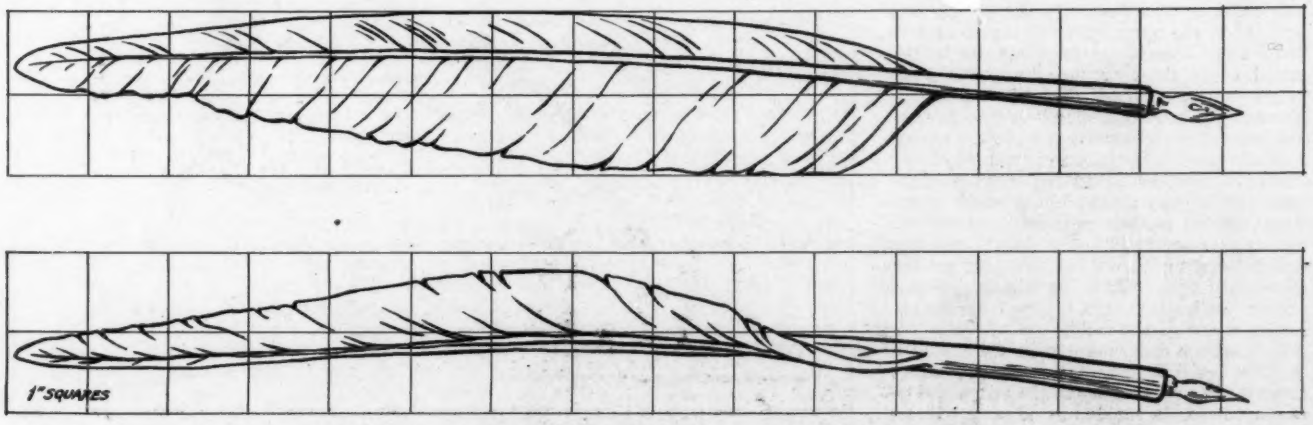
9. What is the usual length of run? Answer: It is impractical to run less than 20,000 sheets (not "jobs") through the presses, and the runs run from that figure up to 5 and 6 million.

10. To what extent is gravure used in catalogs of mail-order houses? Answer: These are having more and more gravure sections each year. Even in an industry as young as gravure, we already find specialists who are doing nothing but gravure for mail-order houses. Gravure sections can be run parallel to letterpress rotaries, and both processes folded in the same piece of printing.

11. To what extent are magazines taking to gravure? Answer: Very much. *Look* is 100 per cent gravure, as well as *This Week*, *Woman's Home Companion*, and many others. *Collier's* is about one-half gravure at the present time.

12. Is help scarce in gravure? Answer: It is! Our plant is now running 24 hours a day, with overtime. More apprentices should be trained right now to keep up with the demand for good workmen.

The path of least resistance leads to nowhere. The strength of the pioneers comes from their having to cut their own paths. — *Advertisement.*



Penholder carved from wood with steel pen point inserted

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These new low cost light power tools are revolutionizing shop equipment programs everywhere. Just figure the saving you make when you specify Delta power tools for your school shop—at no sacrifice in training efficiency or quality of machinery!

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10" Tilting-arbor saw, with motor $138.25

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Motor 23.85

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TOTAL . . $606.00

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Everyone interested in vocational education should have a copy of this remarkable book. It reveals clearly the reasons for the new trend in shop equipment whether for modernizing old shops as well as building new shops. Prepared and submitted by vocational instructors from all over the country—the shop photographs and layouts contained in this new book represent the cream of the hundreds of entries sent in to the board of judges in the recent shop planning contest sponsored by the Delta Manufacturing Company. There are actual photographs and floor plans of 30 shops in this attractive 44-page book. These are authentic school shop layouts embodying the most ingenious solutions of the problems of space, safety, lighting, convenience and teaching efficiency in both small and large schools.

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PREFERRED BY INSTRUCTORS, BOYS, CRAFTSMEN

New to the fine Millers Falls line is this indestructible all-steel Block Plane . . . light in weight, sure and comfortable of grip, strong enough to take any amount of punishment from inexperienced hands, yet fine enough in every detail to meet most of the exacting needs of the skilled artisan. Sensitive, vertical screw blade adjustment, the block plane blade adjustment principle proved by time and preferred by most instructors, makes this tool ideal for school shops.

The blade, clamped to bed and to drop forged frog at 20° work angle, is high quality tool steel, carefully heat treated and tempered to hold a keen cutting edge. Sides and bottom well polished; steel knob, cap, tightening screw, and adjusting nut are nickel plated. Length 6¼"; blade 1⅝" wide; weight ⅞ lb.

Have you a copy of Millers Falls Goodell-Pratt Catalog No. 42? It's free. Write today.

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Personal News

♦ HUGH P. HARSHBARGER, head of the practical-arts department at Maine Twp. High School, has been elected to the three-man executive board, industrial-arts section of the Illinois High School Conference.

♦ MR. CHARLES E. DAWSON has been appointed assistant director of the vocational school at Holyoke, Mass. He will be in charge of a new placement service to be created by the school board. MR. JAMES B. CADIGAN has been appointed to a teaching position in the school.

♦ R. RANDOLPH KARCH, Technical Supervisor, Department of Publishing and Printing, Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., and member of the Educational Commission of the International Association of Printing House Craftsmen, has been chosen by that association as its departmental supervisor of composition.

Association News

♦ The industrial-arts teachers of Texas held a meeting in San Antonio, November 30 to December 2, in connection with the convention of the State Teachers' Association.

At a general meeting attended by the commercial, agricultural, guidance, adult and industrial education groups, Mrs. Estelle Wallace acted as chairman and Dr. Verne C. Fryklund of Detroit was the principal speaker.

The section in industrial education held a meeting, at which Albert McLeland, Fort Worth, was the chairman. Dr. Fryklund delivered an address on "Significant Trends of Industrial Education in America."

The industrial-arts section was in charge of Victor Randel, of Huntsville. Mr. C. E. Rowe, Austin, discussed "Aids in Teaching Drawing"; Dr. Fryklund talked on "Ways and Means of Promoting Industrial Arts in the Schools."

Mr. Charles A. Johnson, Houston, was chairman of the section on trades and industries. Dr. Fryklund talked on "Effective Teacher Training in Vocational Education"; W. B. Arnold discussed "Labor Unions and Vocational Education"; and A. G. Lloyd took up the topic, "Vocational Education and Advisory Committees."

♦ At the November meeting, the School Crafts Club of New York City was privileged to have as its speaker Mr. Charles Frank, the mechanics-arts director of the Kips Bay Boys' Club. Mr. Frank, who is also a teacher in the city schools, finds great interest in working with this group of underprivileged boys. His offering to the club was a presentation of methods in reaching boys in industrial shops. He demonstrated clever devices which he uses to speed up learning and interest, thus developing confidence and assurance in the young craftsman.

The next meeting, January 20, 1940, will be given over to the metal field, especially ornamental metalwork and jewelry. Mr. Albert Verber will be the speaker. — *Harvey E. Parry.*

♦ The Milwaukee Industrial-Arts Teachers held their annual meeting on November 15, in the Cudworth Memorial Building.

Colored motion pictures of "The World of Tomorrow" from the New York World's Fair, were shown. A buffet supper was served to 110 members. Mr. Gregario Sevilla spoke on "The Philippines."

The following officers were elected for the next year: President, George Dally, Boys' Technical High School; vice-president, Marcus G. Fugina, Roosevelt Junior High School; secretary-treasurer, Edward Rang, Thirty-seventh Street School.

♦ The first meeting of the Industrial-Arts Teachers' Association of Newark was held on Thursday, November 2, at Loft's restaurant.

Mr. W. K. Flynn, of the Morristown High School, presented an interesting illustrated lecture on "Football for the Spectator."

The next meeting will be held January 11.

♦ During the Wisconsin Education Association Convention, the Wisconsin Colorado Club held a reunion and breakfast at the Republican Hotel, Milwaukee, on November 3rd. President Russell Britton presided. Mrs. Harold Etherington of Milwaukee related her experiences as a passenger on the *Athenia* when it was torpedoed September 30, 1939. — *George Dally, Secretary.*

♦ The regular annual meeting of the Wisconsin Graphic Arts Teachers' Association was held on November 3, in Milwaukee, with twenty-five men in attendance.

President Leonard Peterson, who opened the meeting, introduced the speaker, Mr. Lew A. Franek, of Milwaukee, who talked on the subject, "What the Printing Industry Expects of the Schools." In his talk Mr. Franek stressed the need of the school to keep abreast of the latest developments in the trade and to impart the information to boys going into the industry.

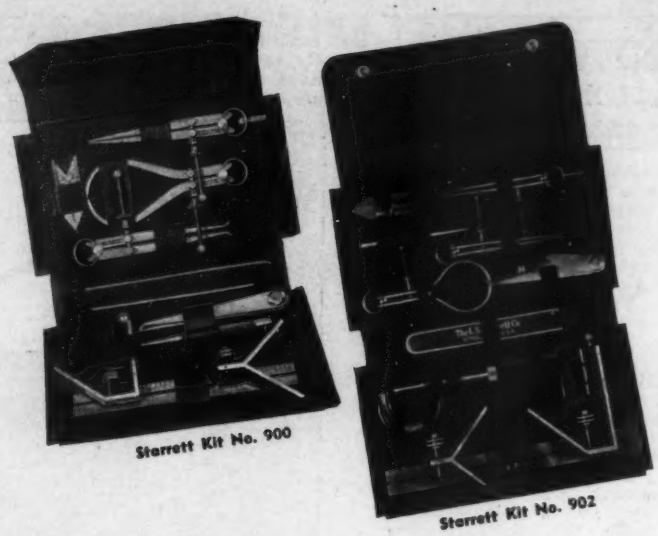
Following the business meeting, the minutes of the previous meeting were read by Secretary O. A. Paciotti, of Beaver Dam.

The officers elected for the next year are: President, Harold O. Griffith, Menasha; vice-president, O. A. Paciotti, Beaver Dam; secretary-treasurer, Harold R. Johnson, Racine; board of directors, R. W. Sturm, West Allis, and Earl Thrall, Beloit. William R. Baker, Menomonie, was elected to the position of director for three years.

By constitutional amendment the annual dues for active membership will henceforth be 25 cents a year. A roster of the printing teachers of the State will also be made for distribution among the active members.

On the suggestion of H. L. Mahnke, Superior, a scrapbook prepared by each of the print-shop teachers throughout the state, should be used as the basis for an exchange of ideas among the

(Continued on page 15A)



The Right Tools for SHOP CLASSES

Starrett Student Kits contain tools selected by hundreds of instructors and supervisors as most essential for work on modern class projects. The tools are all of genuine Starrett quality, guaranteed to give lasting service and satisfaction, yet priced to fit the average school shop budget. Make Starrett Student Kits the foundation of your precision tool equipment. See them at your tool dealer's or write for Starrett Catalog No. 26-CE.

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled—Steel Tapes, Standard for Accuracy—Dial Indicators for Every Requirement

Standardize on STARRETT TOOLS

(Continued from page 12A)

printing teachers attending the convention next year.

William R. Baker led a lively discussion of the various points that had been brought up and the outgoing president, L. A. Peterson, gave an interesting talk on "The Trends in Printing Education." He also appealed to the members to support the state organization and the National Guild.

♦ The industrial-arts sectional meeting of the North Eastern Ohio Teachers Association was opened in Cleveland, October 27, with a luncheon in the ballroom of the Hotel Carter. It was sponsored by the Cleveland Industrial-Arts Club, and the attendance was 278 persons.

Mr. John E. Fintz, Director of Vocational Education and Directing Principal of Cleveland's special schools, gave the principal address. His subject, "The Relationship of Industrial Arts to Vocational Education" was a timely and worthwhile topic. He proved that students with an industrial-arts background chose their vocation more intelligently and accurately than those who lacked this background. He also indicated that the industrial-arts student was inclined to have more initiative and do more individual thinking in mechanical work. He said, "to increase skill" was not a major objective of industrial arts today, but nevertheless, it was a factor resulting in the student advancing more rapidly in his trade training. The keynote of his address was a plea for unity among all forces in education. The speech was a challenge and an inspiration. Everybody seemed to be impressed with the masterful touch of this leader's presentation.

At the afternoon meeting, Dr. Louis V. Newkirk, Director of Industrial Education of the Chicago Public Schools and Dr. Verne C. Fryklund, Associate Professor at Wayne University and Supervisor of Industrial Education, Detroit public schools, were the speakers. Dr. Fryklund spoke on "Being Progressive" and Dr. Newkirk on "Industrial Arts in the Nontechnical School."

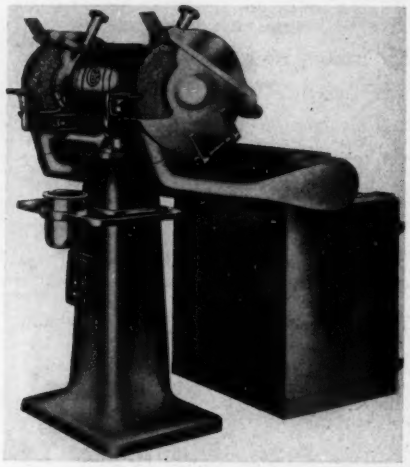
This meeting was attended by 524, and it may be interesting to note that a check made from registration cards showed they had attended 103 different institutions of higher learning.

SHOP EQUIPMENT NEWS
NEW PRODUCTS — PUBLICATIONS

New Air-Master for Grinders and Buffers

The Cincinnati Electrical Tool Company, Cincinnati, Ohio, has announced the "Air-Master," a new purifier attachment for grinders and buffers.

The device which is constructed to fit any grinder or buffer, sucks dust and grit from the grinding wheels, filters the air through a series



of filter bags, and returns the air fresh and pure. Heavier particles fall into a large tray in the bottom of the cabinet, and a foot lever shakes the lighter ones from the filter bag into the tray, which is removable for cleaning.

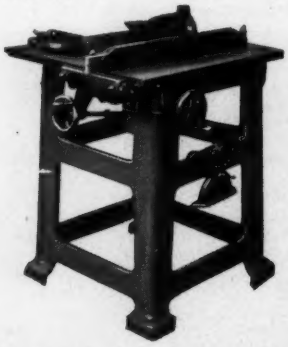
The unit is suitable for use with any make of grinder or buffer having exhaust outlets. It has a fully enclosed motor, a suction fan, and filter bags, all enclosed in a compact, lacquer-finished, insulated cabinet.

Complete information is available upon request.

Wallace No. 11 Universal Saw

J. D. Wallace & Company, 140 S. California Ave., Chicago, Ill., have just announced their newly developed No. 1 Universal Saw.

Motors on this machine are available in one- or two-horsepower, single-phase, capacitor type; or in one- or two-horsepower, three-phase, squirrel-cage type.



Because of the Wallace gear drive used on this saw, a 9-in. diameter saw blade will make a cut 3 in. deep. Removing the standard guard permits the use of an 11-in. blade, cutting 4 in. deep. The spindle speed is 5200 r.p.m.

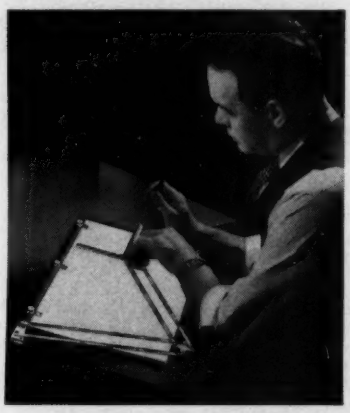
The table top is an accurate steel plate, graduated to show the width of a rip cut. It is mounted on a 4-in. deep-ribbed grid of cast iron that has been ground to close limits. Fence grooves are eliminated on the table surface, the fences sliding on machined flanges on the underside of the table where they are protected against the accumulation of sawdust.

The saw motor tilts and raises and lowers in the frame with large adjusting handwheels — the table remains horizontal for all cuts. Two throat inserts are provided — one for saw blades and one for dado heads. The hood and splitter guard tilts with the motor and is provided with anti-kickback dogs. The lower half of the saw blade is completely guarded, with sawdust outlet at the bottom which may be connected to a dust-removal system if desirable.

Other equipment provided with the machine includes a double-faced micrometer rip fence, locking at both the front and back, two graduated cross-cut fences, one right hand and one left hand, with adjustable gibs for maintaining permanent accuracy, and a 9-in. diameter combination saw blade. The standard machine has a 26 by 28-in. table, providing cross-cutting capacity 14 in. wide, and ripping capacity 12 in. wide. Accessories obtainable with this saw include an extension table to increase the ripping capacity to a full 24 in., an electric-light fixture, all types of saw blades, dado heads, and cope heads for running straight moldings.

Autodraft Portable Drawing Machine

The new "Autodraft" portable drawing machine, just announced by the Eugene Dietzgen Company, Chicago, Ill., will be found useful by every professional artist, draftsman, and others who find it necessary to make sketches.



The "Autodraft" drawing machine provides a drawing board, a T square, a triangle, a scale, a protractor, and paper clamps, all in one. An L-square protractor mechanism is held true by an attached semiuniversal arm, which swings over the entire surface of the board. The protractor may be set at any angle, 0 to 360 degrees, by simply loosening the Bakelit knob. Legs of the L square are graduated in inches, and the entire mechanism is precision engineered of nonreflecting metal. The drawing board is made of rugged, strong, lightweight preswood. It may be obtained in two sizes, 9 by 12 in. and 12 by 18 in.

The "Autodraft" is invaluable for salesmen, draftsmen, contractors, surveyors, and students and is portable for general use.

Speedi-Lap Valve-Seat Refinisher

An air-operated "Speedi-lap" valve-seat refinisher, just announced by the Snap-on-Tools Corporation, Kenosha, Wis., not only mirror finishes valve seats but finish laps each valve into its own seat, giving that perfect final lap which makes the difference between an average job and one that is perfect.

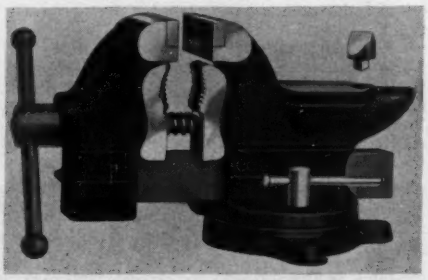
The "Speedi-lap" produces a fine, smooth surface, free from ridges and other defects, leaving a finish you can "see your face in." The "Speedi-lap" oscillates and rotates, and speed can be instantly varied up to 3,000 strokes, and 160 revolutions a minute by pressing a finger control. A knurled nut sets the desired maximum speed.

The tool fits the hand perfectly, is light and well balanced. The simple, flexible drive is machined and finished with great accuracy, to transmit every oscillation directly to the cutters. The die-cast abrasive blocks are machined to within ½ thousandth inch, and contact the abrasive evenly for the full circumference, thus making each abrasive section do its own share of the work. All accessories needed, from pilots to abrasives, are supplied.

Complete information is available upon request.

New Columbian Homeshop Vise

The Columbian Vise Company, Cleveland, Ohio, has announced a new home-shop vise, with a number of outstanding advantages. It has ribs that reinforce the back and front jaws, making for greater strength; a 50 per cent larger working face on a well-supported anvil; a square



shank, tempered-steel cutoff tool that fits snugly into the square hole in the anvil; chrome-nickel alloy replaceable pipe jaws; swivel base with machinist's-type lock nut; and heat-treated steel jaw faces.

It is manufactured with 3-, 3½-, and 4-in. jaws. Complete information is available.

Bakelite Tee-Squares for Schools

An all Bakelite Tee-Square, made especially for student use, has recently been introduced by the Engineering Sales Company of Sheboygan, Wis., manufacturers of high-grade drafting equipment.

Laminated Bakelite is used in the construction of the head and blade, making a unit that is practically indestructible and which will withstand hard student usage. The Bakelite material is strong, flexible, and durable and will maintain a permanently accurate edge.

(Continued on page 19A)

GIVES STUDENTS FINE TRAINING

HEAVY-DUTY THICKNESS PLANER

Here is a fine unit for any school, with unusually wide range. Handles short, thin pieces (6" long by 1/16" thick) that ordinary large planers cannot handle, as well as material up to 12" wide by 4" thick. Maximum cut 1/8". Head and feed rolls completely guarded for safety. Frame has graduated scale to determine depth of cut. Gibs assure accurate alignment.

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- Belt speed of 1200 surface ft. per minute.

Other SKILSAW SANDERS are Model "A," 4 1/2 in. belt, speed of 1500 sur. ft. per min.; Model "B" with vacuum dust collecting system. Write for details.

New Publications

Units in Sheet-Metal Work

By Robert E. Smith. Paper, 47 pages, 8 by 10¾, illustrated. Price, 36 cents. Published by McCormick-Mathers Publishing Co., Wichita, Kans.

Fifteen operation units on the essentials of sheet-metal work. Both hand and machine operations are described. There also is descriptive material on the production of sheet metal and wire.

The book is well illustrated and contains a number of interesting projects besides some tables useful to sheet-metal workers.

How to Plan a School Workshop

Issued by the Delta Mfg. Co., Milwaukee, Wis. Paper, 38 pages, planographed, 8½ by 11, illustrated. Price, $1.

This book contains 28 layouts and photograph views of interiors of school woodworking shops using small power tools.

There is also a very helpful section on the best method of arranging individual machines in the school shop.

A useful bibliography has been appended.

Course-Making in Industrial Education (Industrial Arts and Vocational)

By John F. Friese. Paper, 214 pages, 6 by 9, illustrated. Price, $1.50. Published by the author at 426 Ridge Ave., State College, Pa.

This book, which has successfully passed through three printings in mimeographed form, has been thoroughly revised and now appears in printed form.

A glance at the table of contents shows how thoroughly this modest volume covers the subject. The 21 chapters divide up the book as follows: Course-making guide posts, importance of the job, steps in constructing a course of study, plan and scope of a comprehensive course of study, historical influence, philosophy and scientific techniques, aims of industrial education, aims of the various departments, related content, teaching methods, organization and management, correlation, testing and grading, analyses, course-making by a staff, curriculums, and sample extracts from various industrial courses.

Arc Welding and How to Use It

By W. J. Chaffee. Cloth, 334 pages, 5¾ by 8¼, illustrated. Price, $1.50. Published by Hobart Bros. Co., Troy, N. Y.

This is the third edition of this very practical book. Its content is divided into five parts. The first of these is devoted to general information on the development and application of this type of welding.

Part II contains the practical welding lessons and the use of various types of electrodes.

Part III covers the subjects of carbon arc welding, cutting and sundry applications of the carbon arc.

Part IV is devoted to instructions for welding cast iron, stainless steel, manganese steel, monel metal and nickel, and aluminum.

Part V contains useful tables and data for welders and designers.

Steel for the User

By R. T. Rolfe. Cloth, 280 pages, 5¾ by 8⅝, illustrated, Price, $8.50. Published by the Chemical Publishing Co., New York, N. Y.

A scientific book for the user of steel which contains much valuable data for the engineer, designer, heat treater, and testing-laboratory worker. The book consists of eleven chapters which bear the following headings: Mechanical quality and its assessment, specified requirements for commercial steels, the effect of composition upon mechanical quality, bright and free-cutting steels, the heat treatment of steel — theoretical considerations, industrial heat treatment of low-carbon steels, the heat treatment of high-carbon steels, case-hardening and similar treatments, the use of steels at elevated temperatures, fatigue testing, the general principles of selection.

Make It Yourself

By Julian Starr, Jr. Cloth, 333 pages, 6¼ by 9¼, illustrated. Price, $2.50. Published by McGraw-Hill Book Co., Whittlesey House, New York, N. Y.

Written for the amateur craftsman, the author has divided the book into a number of sections devoted to the shop, its equipment, and the use and care of hand and power tools; projects for the out of doors; furniture; games and toys; novelties; around-the-house jobs; and the making of special rooms.

The book provides ideas and delightful reading even if details are not always as clearly explained as amateurs might desire.

Printing and the Allied Trades

By R. Randolph Karch. Cloth, 318 pages, 5¾ by 8¼, illustrated. Price, $1.50. Published by Pitman Publishing Corp., New York, N. Y.

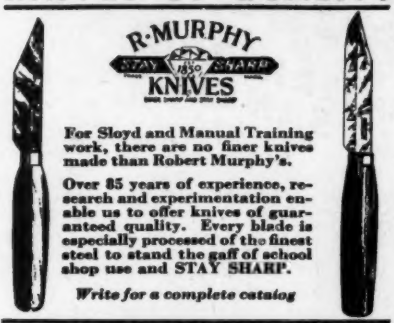
In the revision of this book the author has attempted to make it a text and workbook for industrial-arts students of printing in junior and senior high schools, a related-subjects text and workbook for printing students in vocational high and trade schools, a reference book for printer apprentices and for writers who have contact with printers.

Besides a brief history of printing, there are chapters on modern printing; foundry type; spacing material; straight composition; proving and correcting; distribution; border and rule; setting display composition; commercial printing; mechanical typecasting; lockup and imposition; printing presses; printing plates; duplicate printing plates; ink and color; copperplate engraving; lithography, collotype and gravure; paper; accident and health hazards.

Objective tests have been worked out on the various chapters and a glossary has been appended.

THE MARKET PLACE

KNIVES OF QUALITY



For Sloyd and Manual Training work, there are no finer knives made than Robert Murphy's.

Over 85 years of experience, research and experimentation enable us to offer knives of guaranteed quality. Every blade is especially processed of the finest steel to stand the gaff of school shop use and STAY SHARP.

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Genuine Hoyt Pewter. Contains no lead. Very ductile. Works, solders, etches readily. Sheets up to 24" x 36"; discs 2" to 24" dia.; 14 to 20 gauge.

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In use from Coast to Coast
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ALUMINUM

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For New Schools or Replacements in Old Ones

Patented in August 1912 and since that time the Standard in an increasing number of school shops.

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Standardize on the improved HOLD-HEET Glue Pots

1 qt.....$14
2 qt.....$17
4 qt.....$24
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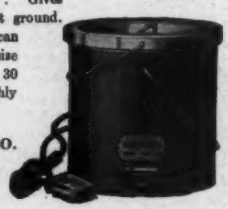
115 or 230 Volts

Teach with the standard equipment of industry. Low-operating cost—saves glue. Uniform temperature within 1°. Gives lifetime service. Safe, will not ground. Listed by Underwriters. You can test before you buy. Just write size and voltage wanted, test it on 30 day Free Trial. If not thoroughly satisfied, return it.



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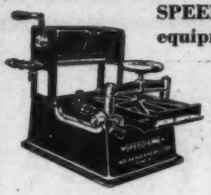
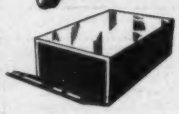


SPEED-LINE Stereotype equipment is practical equipment, the kind found in progressive print shops throughout the country.

A recognized leader in the industry.



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Matrix moulders 45.00
Scorcher 20.00
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Saw (not shown).... 39.50
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CORNER ROUNDER
SHEAR-ACTION SELF-SHARPENING

$15

Over five thousand in use by printers, schools and libraries. Round-cornering will prolong useful life of visible or looseleaf records, catalogs,, letterheads, etc. Easy to operate! No guide adjustments or tools needed. Instantly interchangeable dies. Price includes one die: ⅛", ¼", ⅜" or ½" radius; extra dies $5 each. Shipping Wt. 5 lbs. Send for 10 day trial —or folder V140.

½ inch at a stroke

LASSCO PRODUCTS, Incorporated
485-495 Hauge Street
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Now... your students can make rustic furnishings

RUSTIC CONSTRUCTION

By W. Ben. Hunt

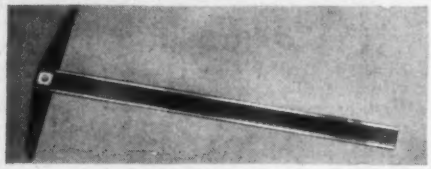
With the material literally lying around almost everywhere waiting to be used, your shop can introduce the construction of rustic furniture, bridges, stairs, swings, fences, etc., described in this book. All the articles are inexpensive, durable, and easy to make, and will fit in perfectly with any surroundings.

Cloth, $1.00; paper, 50 cents

THE BRUCE PUBLISHING COMPANY
701 Montgomery Building Milwaukee, Wis.

(Continued from page 16A)

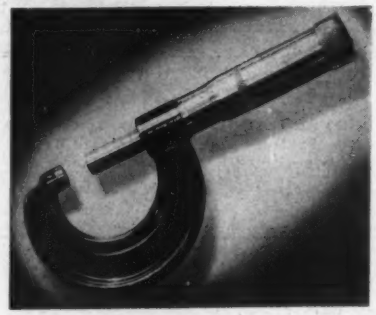
A patented fastening feature holds blade securely and rigidly to the head. This construction also makes it possible to ship tee-squares knocked down in a small package. Every ESCO Tee-Square is provided for a swivel head which



may be added at any time. These new Bakelite Tee-Squares are available in 24-, 30-, 36-, and 42-in. lengths. The price at which they sell is very reasonable.

Starrett Micrometer

The No. 436 Starrett micrometer shown has a black enameled frame, and a stainless-steel sleeve and thimble. This model is made in a complete range of sizes from 0 to 24 inches, and can be graduated to read in English or metric measure.

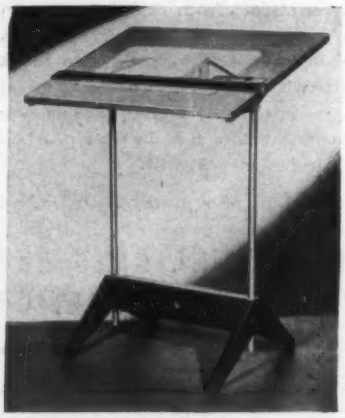


Other additions to the line include micrometers that are made stain resisting by chromium plating with Carboloy-faced anvils and spindles, or with Norbide inserts for use under severe abrasive conditions.

Starrett Micrometers are now made rust, stain, and wear resistant, according to announcements made by the L. S. Starrett Co., Athol, Mass.

Hamilton Handy Drawing Stand

THE HAMILTON MANUFACTURING COMPANY, Two Rivers, Wis., has issued a four-page circular, describing its line of drawing supplies, including



drawing kits, drawing stands, T squares, straightedges, and erasing shields for the use of drawing students.

The drawing stand for students and instructors is one which is outstanding in design and construction. It is ideal for light work, as well as suitable for use by students in their homes.

(Continued on page 23A)

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FOR SPINNING

Circles—2" to 20" dia.—14-15-16-18 ga.
Sheets—18"x24"—12-14-15-16-18 ga.
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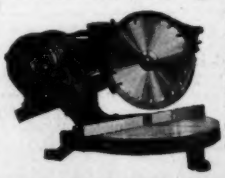

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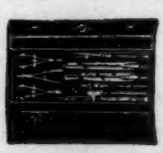

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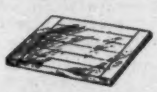

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(Continued from page 19A)

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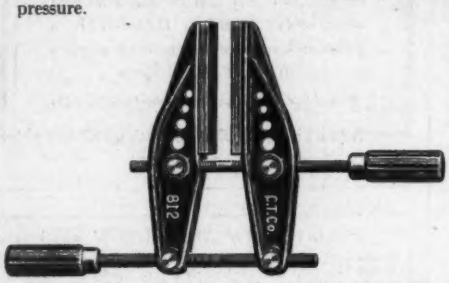
THE CINCINNATI TOOL COMPANY, Cincinnati (Norwood), Ohio, has issued a circular, describing and illustrating its metal-jaw, double-strength hand screw, which has jaws much stronger than wood, and stiffer screws which give greater pressure.



The device which has been tested to 4,000 pounds, has close-fitting parts, hardened bearings, easy balance, and no excess weight and its wood faces prevent marring of work. It has much longer life and it is not injured by heat or moisture.

Complete information is available upon request.

THE THURSTON SUPPLY COMPANY, Anoka, Minn., has issued its twenty-fifth Annual Catalog of "hard-to-get" materials, listing and describing a wide variety of tools and supplies for industrial-arts departments in high schools, colleges, and other institutions.

The catalog, which contains 84 pages, lists such items as hardware, craft fiber, finishing supplies, glue, carved moldings, upholstery supplies, abrasive papers, dowels, table hardware, varnish, polishing wax, wood panels, and steel wool.

THE DEWALT PRODUCTS CORPORATION, Lancaster, Pa., has perfected a woodworking film, showing 1,000 feet of a woodworking machine. It can be used with any 16 mm. sound motion-picture machine and gives minute details of every phase of wood cutting. It is an ideal film for use in school woodworking classes and for educational meetings, and is especially adapted to students in manual training shops.

THE PORTER-CABLE MACHINE COMPANY, Syracuse, N. Y., has issued a new 24-page booklet, entitled "Modern Maintenance Methods," which gives full directions for efficiently using up-to-date floor maintenance methods and machinery.

The booklet is divided into the following parts: (1) floor maintenance, (2) sanding and refinishing, (3) sawing. A saw-blade table and a finishing table are included.

THE BROADHEAD-GARRETT COMPANY, Cleveland, Ohio, has issued its Annual Catalog No. 39, listing and describing its line of school supplies, including cabinet woods, shop machinery, woodshop tools, finishing materials, metal-shop supplies, leathercraft, loom weaving, fine arts, mechanical-drawing supplies, ceramics, plastics, and farm-shop, electrical-shop, and automotive supplies.

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THE NOVEMBER, 1939, STANLEY NEWS announces the 1940 Stanley Plan Packet, containing 25 new project designs. All of these designs were adjudged prize winners in the 1939 Stanley contest. They have been redrawn and are obtainable printed in black on 8½ by 11-in. sheets, punched for standard 3-ring, looseleaf binders.

For information, address Department I.A.V.E. —1, Stanley Tools, New Britain, Conn.

News Notes

♦ The Milwaukee Civic Alliance, Milwaukee, Wis., composed of seventeen civic and businessmen's clubs of the city and suburbs, has adopted a job-finding program, designed to aid 19,000 unemployed youths between the ages of 18 and 25. Dr. John W. Hansen, president of the club, has appointed a committee of three to encourage the members to find jobs for young people. The youth job program has been worked out by the Milwaukee Vocational School and jobless youths will be interviewed at the school concerning their education, skill, and adaptability to industry. A survey sponsored by the vocational school among 35,245 young people, showed 13,393 were not employed full time, 3,877 were attending school, and 17,975 were employed.

♦ The board of education of Junction City, Kans., has cooperated with the State Board of Vocational Education and the local chamber of commerce in promoting a program comprising four adult vocational courses. Classes will be offered in retail selling, window display, show-card writing, advertising layout, and copywriting. Classes will begin the middle of January and will continue for ten weeks, meeting two evenings each week. Each class must have a minimum of fifteen students before it can be started.

♦ A new shop building, costing $40,000, has been erected at Longview, Tex. It has been furnished with new equipment for teaching industrial-arts courses.

♦ *Consumer Quiz* is a monthly consumer education aid published by Consumers Union of U. S., Inc., 17 Union Square West, New York City. Each issue contains at least two projects for consumer education classes, as well as discussion questions based on Consumers Union Reports. Free sample on request.

New Publications

Practical Arts Series

Paper, 6 by 9. Published by McKnight and McKnight, Bloomington, Ill.

Planning, by Hugh P. Harshbarger, 32 pages, 20 cents.

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Rustic Construction

By W. Ben. Hunt. 78 pages, 6 by 9, illustrated. Price, Cloth, $1. Paper, 50 cents. Published by The Bruce Publishing Co., Milwaukee, Wis.

This book will appeal especially to the lover of the out of doors. The furniture, fixtures, equipment, fences, gates, arbors, bridges, wayside stands, road signs, and birdhouses, described and illustrated in the book will admirably fit into the settings found in or at camps, summer homes, rural homes, parks, and the like.

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A Guide to Textiles

By Mary Evans and Ellen B. McGowan. Cloth, 233 pages, 6⅛ by 9¼, illustrated. Price, $2.50. Published by John Wiley & Sons, Inc., New York City.

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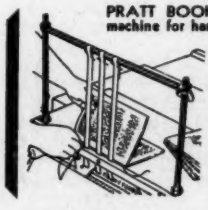

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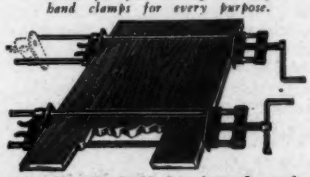

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